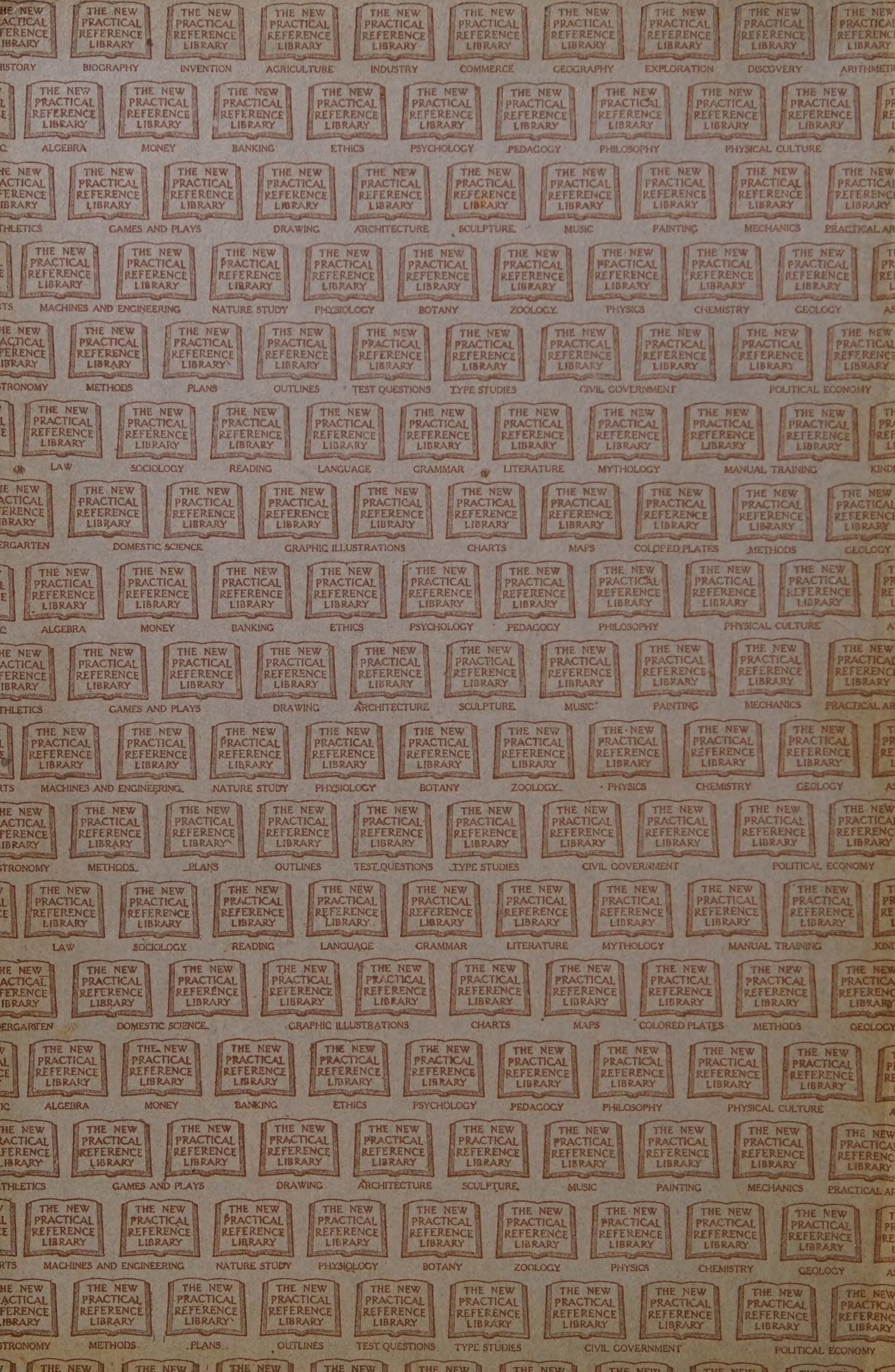
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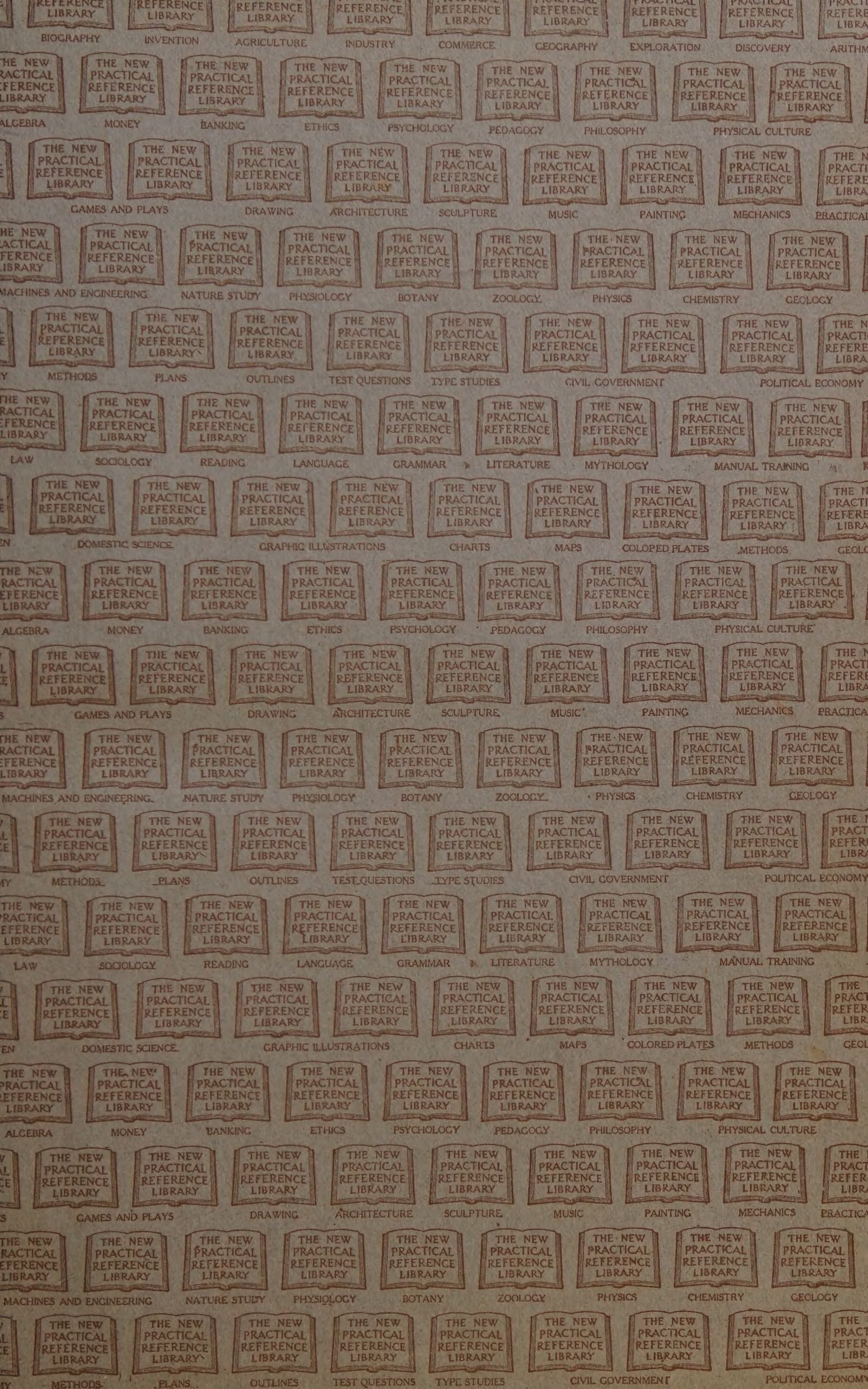
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VOLUME I

CHICAGO NEW YORK
HANSON-BELLOWS COMPANY
1911

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PREFACE

THIS library has been prepared in response to a general demand for a reference work of medium size which presents in a practical way the answers to the many and varied questions which rise in the course of everyday experience. While intended primarily for the use of students and their teachers, it will be found of permanent value to those busy people in every occupation who desire brief and direct information not easily accessible elsewhere. Accuracy, balance, clearness and convenience are the essential characteristics of such a work, and the editors feel that THE NEW PRACTICAL REFERENCE LIBRARY conforms in a notable degree to these requirements.

To secure balance and accuracy, the work was divided into more than a score of departments, such as geography, pedagogy and education, biography and history. These departments were given to qualified editors, who worked under careful supervision and who finally brought together the thousands of articles which they had written and adjusted them in harmony with the proportions of the work. The editors have not relied solely upon their own experience and judgment, but have had the advice and assistance of business men and educators from every state in the Union. The latest information has been secured through thousands of letters addressed to prominent persons in the important towns and cities of the United States. The state articles have been revised by residents possessing full information concerning their own states. Statistics have been compiled from the very latest reports, provided they had the merit of strict reliability, and the narrative of events is brought to the eve of publication.

The department of pedagogy and education has been wrought out more fully than was ever before attempted in any work of this kind, and consists of practical articles on psychology, the history of education and methods of teaching; information concerning important universities, colleges and other educational institutions; brief accounts of educational systems in states and countries, and a large number of biographies of men who are prominent in educational affairs. Geography is the largest department, but others, such as natural history, law and politics, art, literature, music and mechanic arts, have been given space and consideration adequate to their great demands.

The language is direct and simple, technicalities of all sorts have been studiously avoided, and it is felt that almost anyone can read any article and understand its contents. Nevertheless, scientific accuracy has not been sacrificed.

To make the work convenient in use, the long articles have been divided by conspicuous subheads. Moreover, the greatest care has been taken to arrange material under the most common and appropriate headings; in other words, to place it in the spot where it will be oftenest sought. At the same time references are made to it from all other closely related articles. This system of cross-references binds together, also, the material of every department, and enables the reader to find quickly anything relating to the subject he seeks. By following the references one is led into broad courses of systematic reading.

In appearance, the volumes are a notable improvement upon other works of reference of similar size, and in one respect are unique, namely, in the use of large, clear type. In a large encyclopedia that is rarely consulted, and then only for brief moments, one might possibly justify small type, but a useful book for daily reference by young students and busy people should make no unnecessary demands on the eyesight, nor waste valuable time with its crowded lines.

The publishers have admirably embellished the work with the finest multicolored illustrations, new engraved colored maps and vivid relief maps of the continents; choice full-page, colored halftones; new and correct pen and ink portraits, and more than a thousand other pictures. As all have been selected primarily for the important purpose of clarifying and broadening the text, they form an integral part of the work.

The pronunciation of all but the simplest titles is indicated by phonetic respelling.

The work is thoroughly American in its attitude toward all topics, and ample space has been given to those things with which the average American is inevitably concerned. On the other hand, those foreign persons, places and events which are interesting and important to an American student have been treated generously. This library of reference is modern; and present-day facts, forces and tendencies have been regarded as of more interest and importance than ancient history.

The publishers wrote to more than fifteen hundred prominent educators, including every state superintendent and leading city and county superintendents, asking what should constitute the salient features of such an important work as this. With very few exceptions the inquiries were answered at length. The publishers therefore desire especially to thank these educators for their many helpful and valuable suggestions, and also desire to acknowledge their great indebtedness to those whose names appear on other pages as direct contributors.

The editors have felt the responsibility which has rested upon them, and they have spared no effort to make The New Practical Reference Library a work of value to inquirers of all classes, a work that scholars will appreciate.

C. H. S.

Chicago, *January 1, 1907.*

NEW-CENSUS EDITION

Since the original *Preface* was written several editions have appeared. The extraordinary sale of the work has justified its creation and has established it as an authority throughout the country. Each succeeding edition has been an improvement on its predecessor and has carried out, more fully, the idea of making The New Practical Reference Library the one indispensable requirement for every home.

The present, or New-Census Edition, is from plates entirely fresh and new, and carries with it numerous additional color plates, halftones, maps and drawings. It is dressed in an attractive and serviceable new binding more in keeping with its beauty and usefulness.

The text has not been neglected; besides new articles on many of the states, cities and prominent people, there have been inserted a number of new titles of subjects which have come into prominence since the last edition. Returns from the Government Census Bureau have made it possible to correct the population figures of the states, the leading cities and towns; in fact, the volumes have been thoroughly revised up to the date of going to press.

The Educator which accompanies The New Practical Reference Library has been enlarged and improved until it is fully abreast of the work it is intended to elucidate.

Thanking our patrons for their loyal support in the past, we confidently hope for their approval of The New Practical Reference Library.

The Editors.

Chicago, *May 1, 1911.*

PRONUNCIATION

The pronunciation of titles is indicated by accenting the word or by respelling it phonetically in italics. In the phonetic spelling, letters are used to indicate the sounds which they most commonly represent.

A vowel is *short* when followed by a consonant in the same syllable, unless the syllable ends in silent *e*.

A vowel is *long* when standing alone or in a syllable which ends in silent *e* or when ending an accented syllable.

S is always soft, and never has the sound of *z*.

The foreign sounds which have no equivalent in the English language are represented as follows:

K for the German *ch*, as in Bach: (**Bach,** *baK*).

N for the French *n*, as in Breton: (**Breton,** *bre toN′*).

ö for the German *ö*, as in Göttingen: (**Göttingen,** *gö′ting en*).

ü for the German *ü*, as in Blücher: (**Blücher,** *blüK′ur*).

A

A, the first letter in almost all alphabets. In its primary sound, that of *a* in *father*, it is the purest of the vowels and is produced with the entire vocal channel in the most open position possible. Most modern languages, as French, Italian and German, have only one sound for *a*, namely, that heard in *father*, but in English this letter is made to represent eight sounds, as in the words *father*, *mat*, *mate*, *mare*, *final*, *ball*, *what* and *ask*, besides being used in such digraphs as *ea* in *heat* and *oa* in *boat*.

A, in music, is the sixth note in the diatonic scale of C, and stands when in perfect tune to the latter note in the ratio of $\frac{3}{5}$ to 1 (See Music). The second string of the violin is tuned to this note.

A 1, a symbol attached to wooden vessels of the highest class in Lloyd's register of shipping. A refers to the hull of the vessel, while 1 intimates the sufficiency of the rigging and whole equipment. See Lloyd's.

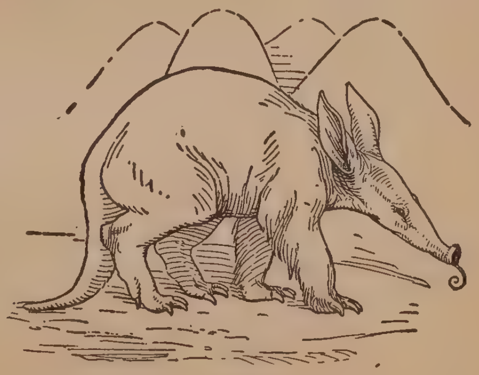
Aachen, *ah'ken*. See Aix-la-Chapelle.

Aalborg, *awl'borg*, (eel castle), a seaport of Denmark, in Jutland, on the south shore of the Lim-Fjord, connecting the Cattegat and the North Sea. The manufactures, consisting of brandy, spirits, lumber, leather and soap, and the fisheries are increasing rapidly. Aalborg has a museum, cathedral and a library of 30,000 books. Population in 1901, 31,462.

Aali Pasha, *ah'le pa shah'*, (1815–1871), a distinguished Turkish statesman. At the age of fifteen he became a clerk in the foreign office and rose steadily from one diplomatic post to another, at home, Vienna and elsewhere, till in 1844 he became ambassador at London. This varied experience left on his mind a profound impression of the absolute necessity for extensive reforms in the government of the Ottoman Empire; and these reforms he attempted, without success, to introduce. At the Congress of Paris he represented the porte, and maintained its cause with zeal and skill. He was grand vizier more than once and was made field marshal and pasha. He was active in repressing Egyptian efforts to shake off the supremacy of the porte.

Aar or **Aare**, *ahr*, (ancient Obringa) a river of Switzerland, which rises in the upper Aar glacier of the Schreckhorn, in the canton of Bern. It crosses the lakes of Brienz and Thun and falls into the Rhine opposite Waldshut. It is navigable from the Rhine to Thun, and a canal has been built between Meiringen and the Brienz.

Aard-vark, *ahrd vahrk*, an ant-eater found in South Africa. It is a stout animal, with long, pig-like snout, tubular mouth, the usual termite-catching tongue, large ears, fleshy tail and short, bristly hair. The limbs are short and very muscular; on the fore feet are four, on the hind five, powerful claws, used in burrowing and in excavating the hills of the white ants on which it feeds. It is nocturnal in its habits and is very inoffensive and timid. When pursued, it can burrow itself out of sight in a few minutes, working inward with such rapidity as to make it almost impossible to dig it out. Its total length is about five feet, of which the tail is about one foot nine inches. Its dwelling is a burrow at a little distance from the surface, and thence it may



AARD-VARK

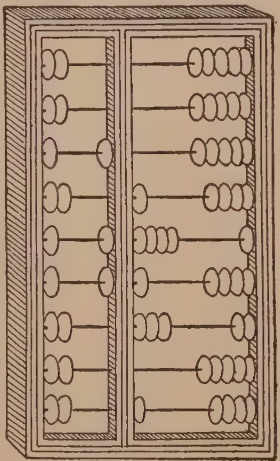
be observed creeping at dusk. The flesh is considered a delicacy.

Aard-wolf, a South African carnivorous animal, fox-like in size and habit, but having longer ears and a less bushy tail. It resembles a hyena in its sloping back and in its color, the body being gray, irregularly striped with black, but it has five toes on the fore feet, and the head is much more pointed and civet-like. It feeds on carrion, white ants and the like, but not on living vertebrates. It is timid and nocturnal in its habits, social but quarrelsome in its life, and tolerably swift in its pace, though usually trusting rather to burrowing than to flight.

Aarhuus or **Aarhus,** *awr'hoos,* a seaport of Denmark, in Jutland, on the Cattegat, 37 mi. e. of Viborg. It has a cathedral, a library of 200,000 volumes and various manufactures. Population in 1901, 51,900.

Aaron, *ar'un,* the elder brother of Moses, always second to him in command, but one of the greatest of the Jewish high priests. He acted as spokesman for Moses when the latter delivered the Jews from the Egyptians, and he was one of the leaders of the nation in its wanderings. When Moses was on Mount Sinai, Aaron made the golden calf which the Israelites worshiped. Aaron was not allowed to enter Canaan, but died and was buried on Mount Hor. See *Ex.* xxix; *Num.* xvi and xx, 8–13.

Ab'acus, a calculating machine used in teaching the elements of number. It consists of a rectangular frame which holds parallel rods upon which beads or balls are strung. A handle is attached to the lower side of the frame, so that when the abacus is in use the rods are held in a horizontal position. The ancient abacus contained vertical columns which corresponded to the order of figures, as units, tens and hundreds. This instrument was in general use among the Greeks and Romans, and is still employed in Persia and other countries of the Far East for reckoning purposes. The Chinese abacus is called *shwanpan,* which means *reckoning board.*



CHINESE ABACUS

Ab'alo'ne or **Ear Shell,** a Californian mollusk, of which there are several species. The shell is a very broad spiral that resembles a shallow dish lined with bright mother-of-pearl, and has considerable commercial value. The animal, which moves about over rocks at the bottom of the sea near the shore, is an important article of food for the Chinese and other Oriental peoples.

Ab'atis, a very old defense, still used in fortifications, although wire entanglements are more effective. The ordinary abatis consists of trees fastened down side by side with their sharpened branches pointed toward the enemy.

Ab'bey, a monastery or religious community governed by an abbot; or in the case of a female community, by an abbess. The difference between a priory and an abbey is that the former is a less extensive establishment and is governed by a prior. Among the most famous abbeys in Europe are those of Cluny and Clairvaux in France, the Abbey of Saint Galle in Switzerland, and Fulda in Germany. Among the famous English abbeys are those of Westminster, Tintern, Paisley and Saint Mary's of York. At the time of the Reformation the abbeys in England were destroyed by Henry VIII.

Abbey, Edwin Austin (1852–), an American painter, born in Philadelphia. He studied in the United States and removed to England in 1883. His first works of importance were illustrations for periodicals, and water-color paintings. The *Search for the Holy Grail,* in the Boston Public Library, is his most noteworthy production. As a colorist and intellectual painter, Abbey ranks among the foremost American artists.

Ab'bot, a prelate of high rank in the Roman Catholic Church, who governs a convent or monastery. The first abbots were laymen, but priestly abbots appeared in the Western Church in the seventeenth century and have continued to the present day. Their powers were at first limited, but as the abbeys grew in wealth the abbots grew in power, until they came to be ranked next to bishops as prelates of the Church and had the right to vote in church councils. Abbots are elected by the assembly of monks, and the election is confirmed by the pope or the bishop, who has direct control over the monastery. See Abbey.

Abbot, Ezra (1819–1884), an American biblical scholar. He studied at Phillips Exeter Academy, graduated at Bowdoin in 1840, and in 1856 became assistant librarian at Harvard. From 1872 until his death he was professor of New Testament interpretation in the Cambridge Divinity School. Perhaps his most important work was in connection with the American Revision of the Bible, the scholarly accuracy of which he did much to secure. He left his main library of five thousand volumes to Harvard, the remainder to the Cambridge Divinity School. His chief book is *The Authorship of the Fourth Gospel.*

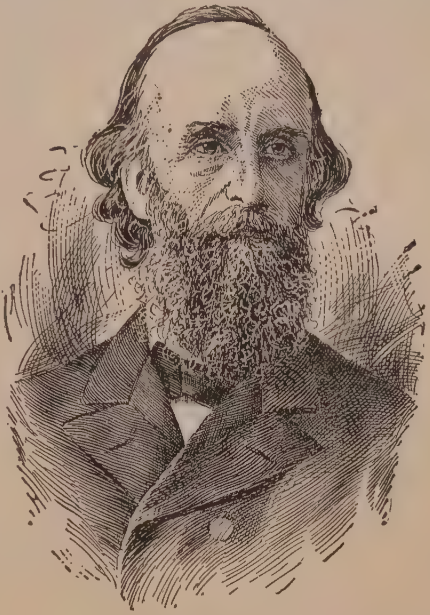
Ab′botsford, the former country seat of Sir Walter Scott, on the south bank of the Tweed, near Melrose Abbey, 28 mi. s. e. of Edinburgh, Scotland. In 1811 it was purchased by Scott and given its name because it was located near a ford which was formerly used by the abbots of Melrose. It stands in the midst of picturesque scenery, forming an extensive and irregular pile in the Scottish baronial style of architecture.

Abbott, Charles Conrad (1843-), an American naturalist, some of whose books, dealing with his out-of-door observations, have earned for themselves a wide circle of readers. Among these books are *A Naturalist's Rambles about Home, Clear Skies and Cloudy* and *In Nature's Realm.*

Abbott, Jacob (1803–1879), a popular American writer of books for the young. He was a teacher and subsequently a clergyman, but after 1839 he devoted himself entirely to writing. Of his two hundred volumes, the best-known are the *Rollo Books* and the *Franconia Stories.*

Abbott, John S. C. (1805–1877), an American author and Congregational minister in Massachusetts. Among his writings are *The History of Napoleon Bonaparte, Napoleon at St. Helena, The History of Napoleon III, History of the Civil War in America, Marie Antoinette* and *Josephine.* He was a brother of Jacob Abbott.

Abbott, Lyman (1835-), a clergyman, son of Jacob Abbott, born in Massachusetts. He graduated at the University of New York and was admitted to the bar. He studied theology and was ordained in the Congregational Church in 1860. For five years he preached in Terre Haute, Ind., and later was pastor of the New England Church in New York City, but resigned in 1869. He edited the "Literary Record" of *Harper's Magazine,* the *Illustrated Christian Weekly,* and was associated with the Rev. Henry Ward Beecher on the *Christian Union,* afterward becoming editor in chief. In 1889 he became pastor of Plymouth Church, Brooklyn, where he remained for ten years, when he became editor of *The Outlook,* the successor of the *Christian Union.* Mr. Abbott wrote a *Life of Henry Ward Beecher* and edited Beecher's sermons. He also contributed frequently to leading magazines, upon religious themes.



LYMAN ABBOTT

Abbre′via′tions, devices for saving time and space, consisting either of shortened forms of words, or of arbitrary signs or symbols substituted for words. The most common method of abbreviating is the substitution of the initial letter for the word itself, but one or more letters are often added to prevent ambiguity. Abbreviations were in common use among the Greeks and Romans, and in the manuscripts of the Middle Ages they were so numerous as to render some works exceedingly difficult to read. Even after printing was invented, the excessive use of abbreviations continued for a time.

The following brief list contains many of those abbreviations that are not easily recognized:

A. B.	*Artium Baccalaureus,* Bachelor of Arts.
A. D.	*Anno Domini,* in the year of the Lord.
ad lib.	*ad libitum,* at pleasure.
Ala.	Alabama.

Alas. Alaska.
A. M. *Ante meridiem*, before noon; *Ars Magister*, Master of Arts.
Ari. Arizona.
Ark. Arkansas.
Ave. Avenue.
B. A. *Baccalaureus Artium*, Bachelor of Arts.
B. C. Before Christ; British Columbia.
B. D. *Baccalaureus Divinitatis*, Bachelor of Divinity.
B. M. *Baccalaureus Medicinae*, Bachelor of Medicine.
B. S. Bachelor in the Sciences.
B. V. *Beata Virgo*, Blessed Virgin, *Bene vale*, farewell.
B. Y. P. U. Baptist Young People's Union.
Cal. California.
C. E. Civil Engineer.
C. J. Chief Justice.
C. M. Common meter.
C. O. D. Cash (or collect) on delivery.
Col. or Colo. Colorado.
Con. *Contra*, against, in opposition.
Conn. or Ct. Connecticut.
Cf. *Confer*, compare.
Cr. Credit, creditor.
C. S. A. Confederate States of America; Confederate States Army.
Ct. Connecticut; court.
Dak. Dakota.
D. C. *Da Capo*, from the beginning—in music it means repeat; District of Columbia.
D. D. *Divinitatis Doctor*, Doctor of Divinity.
Dec. December; declination.
Deg. Degree; degrees.
Del. Delaware; delegate; *delineavit*, he (or she) drew it.
Dept. or Dpt. Department.
do. *Ditto*, the same.
D. P. *Doctor Philosophiae*, Doctor of Philosophy.
Dr. Debtor; doctor; drachms.
D. Sc. Doctor of Science.
D. V. *Deo volente*, God willing.
E. East.
E. G. *Exempli gratia*, for example.
Esq. Esquire.
et al. *Et alii*, and others.
etc. or &c. *Et cetera*, and others, and so forth.
et seq. *Et sequentes*, *et sequentia*, and what follows.
Fahr. or F. Fahrenheit.
Fla. Florida.
f. o. b. Free on board.
Fol. Folio.
Ga. Georgia.
G. A. R. Grand Army of the Republic.
G. B. Great Britain.
Gov. Gen. Governor General.
G. P. O. General Post-office.
H. I. Hawaiian Islands.
H. J. S. *Hic jacet sepultus*, here lies buried
Ia. Iowa.
Ib. or ibid. *Ibidem*, in the same place.
Ida. Idaho.
i. e. *Id est*, that is.
Ill. Illinois.
Ind. Indiana, index.
Ind. T. or I. T. Indian Territory.

I. O. U. I owe you.
Jr. Junior.
Kan. Kansas.
K. C. B. Knight Commander of the Bath.
Ky. Kentucky.
La. Louisiana.
Lat. Latitude.
lb. or lbs. *Libra* or *librae*, pound or pounds in weight.
L. I. Long Island.
Lieut. or Lt. Lieutenant.
LL. B. *Legum Baccalaureus*, Bachelor of Laws.
LL. D. *Legum Doctor*, Doctor of Laws.
LL. M. *Legum Magister*, Master of Laws.
M. A. Master of Arts; Military Academy.
Mass. Massachusetts.
M. B. *Medicinae Baccalaureus*, Bachelor of Medicine; *Musicae Baccalaureus*, Bachelor of Music.
M. C. Member of Congress; Master of Ceremonies; Master Commandant.
Md. Maryland.
M. D. *Medicinae Doctor*, Doctor of Medicine.
Mdlle. Mademoiselle.
Mdse. Merchandise.
Me. Maine.
M. E. Methodist Episcopal; Military or Mechanical Engineer.
Messrs. *Messieurs*, Gentlemen.
Mex. Mexico, or Mexican.
Minn. Minnesota.
Miss. Mississippi.
Mme. *Madame*, Madam.
Mo. Missouri; month.
Mont. or Mon. Montana.
M. P. Member of Parliament; Member of Police; Methodist Protestant.
Mr. Mister.
Mrs. Mistress.
M. S. Master of Science; *Memoriae sacrum*, sacred to the memory.
MSS. *Manuscripta*, manuscripts.
N. B. New Brunswick; North Britain (that is, Scotland); North British (that is, Scotch); *nota bene*, mark well, take notice.
N. C. North Carolina.
N. E. New England; northeast.
Neb. Nebraska.
Nev. Nevada.
N. H. New Hampshire.
N. J. New Jersey.
N. M. New Mexico.
No. or no. *Numero*, number.
N. Y. New York.
O. Ohio.
O. K. (Jocular). All right or correct.
Okl. Oklahoma.
Or. or Ore. Oregon.
O. T. Old Testament.
oz. *Onza*, ounce.
P. or p. Page; part; participle; *pondere*, by weight.
Pa. Pennsylvania.
Per cent. *Per centum*, by the hundred.
Ph. B. *Philosophiae Baccalaureus*, Bachelor of Philosophy.
Ph. D. *Philosophiae Doctor*, Doctor of Philosophy.
P. I. Philippine Islands.

P. M. *Post meridiem*, afternoon, evening; Past Midshipman; postmaster.
P. O. Post-office; Province of Ontario.
Port. Portugal, or Portuguese.
pp. Pages.
Pres. President.
Prof. Professor.
pro tem. *Pro tempore*, for the time being.
Q. E. D. *Quod erat demonstrandum*, which was to be proved
R. I. Rhode Island.
R. R. Railroad.
R. S. V P *Repondéz s'il vous plaît*, answer, if you please—please reply.
Ry. Railway.
S A. South America; South Australia.
S. C. South Carolina: Supreme Court.
Sc. B. *Scientiae Baccalaureus*, Bachelor of Science.
S. D. South Dakota.
Sr. Senior.
Syn. Synonym; synonymous.
Tenn. Tennessee.
Ter. Territory.
Tex. Texas.
Th. or Thurs. Thursday.
Treas. Treasurer.
Ult. *Ultimo*, last; of the last month.
U. S. A. United States of America; United States Army.
U. S. M. United States mail; United States Marines.
U. S. N. United States Navy.
U. S. S. United States Senate; United States ship.
Ut. Utah.
Va. Virginia.
viz. *videlicet*, to wit, namely.
vs. *Versus*, against; *versiculo*, in such a verse.
Vt. Vermont.
Wash. Washington.
W. C. T. U. Women's Christian Temperance Union.
Wis. Wisconsin.
W. Va. West Virginia.
Wy. Wyoming.
Xmas. Christmas.
Y. M. C. A. Young Men's Christian Association.
Y. P. S. C. E. Young People's Society of Christian Endeavor.
Y. W. C. A. Young Women's Christian Association.

Abd-el-Kader, *ahbd′el kah′dur*, (1807–1873), a famous Arab chief. He distinguished himself by his determined resistance to the French arms in North Africa. In 1835 he was strong enough to inflict a signal defeat on General Trézel, but the French gradually obtained the mastery. Abd-el-Kader was sent to Toulon and was liberated by Louis Napoleon in 1852.

Ab′dica′tion, properly the voluntary, but sometimes also the involuntary, resignation of an office, especially that of a sovereign. The more important abdications since the eighteenth century are the following:

Charles Emmanuel IV of Sardinia	June 4, 1802.
Charles IV of Spain	March 19, 1808.
Joseph Bonaparte of Naples	June 6, 1808.
Gustavus IV of Sweden	March 29, 1809.
Louis Bonaparte of Holland	July 2, 1810.
Napoleon of France	April 14, 1814. June 22, 1815.
Victor Emmanuel of Sardinia	March 13, 1821.
Charles X of France	August 2, 1830.
William I of Holland	October 7, 1840.
Louis Philippe of France	February 24, 1848.
Ferdinand of Austria	December 2, 1848.
Charles Albert of Sardinia	March 23, 1849.
Isabella II of Spain	June 25, 1870.
Amadeus I of Spain	February 11, 1873.
Abd-ul-Aziz of Turkey	May 30, 1876.

The English law, that the king cannot abdicate without the consent of Parliament, is contrary to the custom of many countries.

Abdo′men, in man, the lower cavity of the trunk, separated from the upper cavity, or thorax, by the diaphragm and bounded below by the bones of the pelvis. It contains the intestines, liver, stomach, spleen, pancreas, kidneys and other organs. A serous membrane, called the *peritoneum*, lines the cavity and is reflected from it in such a way as to enclose the contents, giving them the necessary freedom of movement and at the same time keeping them in their proper position. This membrane is the seat of the disease peritonitis. The chief organs of the abdomen and chest are shown in the plate. See plate facing next page.

Abd-ul-Aziz, *ahbd′ul az eez′*, (1830–1876), thirty-second sultan of the Ottoman Empire, brother to Abd-ul-Medjid, whom he succeeded in June, 1861. He concluded treaties of commerce with France and England, both of which countries he visited in 1867. He was deposed in May, 1876, and in June of the same year he committed suicide, or more probably was assassinated.

Abd-ul-Hamid II, *ahbd′ul ha meed′*, (1842–), thirty-fourth sultan of the Ottoman Empire, son of Abd-ul-Medjid, succeeded to the throne on the deposition of his brother, Murad V. The country at his accession was in a disturbed condition, to which the declaration of war by Russia in 1877 came as a climax. The Turks were defeated, and the Empire might have been completely overthrown, had not the European powers, fearing that Russia would grow too powerful, interfered in the peace negotiations. Turkey did, however, lose all claim to Bosnia, Bulgaria, Herzegovina, Montenegro, Roumania and Servia. The sultan was also obliged to promise a reform in his treatment of his Christian subjects, but these promises he never fulfilled. However, by constantly playing the European nations against one another, he succeeded in warding off their interference. In 1908 he was compelled by the Young Turks to grant a constitution, and in April, 1909, he was deposed.

Abd-ul-Medjid, *ahbd′ul me jeed′,* (1823–1861), thirty-first sultan of the Ottoman Empire. He succeeded his father, Mahmud II, in 1839. Abd-ul-Medjid favored reforms, but most of them remained inoperative, or caused bloody insurrections where attempts were made to carry them out. His reign was marked by the Crimean War and by the menace of Mehemet Ali of Egypt.

À Beck′et, Thomas. See Becket, Thomas à.

A′bel, the name of the second son of Adam and Eve (*Gen.* IV, 2). Abel was a shepherd and, according to the biblical story, offered his sacrifices in such a spirit that they were regarded with greater favor by the Lord than were Cain's. The latter, enraged at this, slew his brother.

Abelard, *ab′e lard,* Pierre, (1079–1142), an illustrious French scholastic philosopher and theologian. He went to Paris at the age of twenty, where he established himself as a philosophical lecturer in 1113. Later he obtained the chair held by his former master. At this moment his reputation was greatest. From Rome, England and Germany, students hastened to listen to his eloquent logic, and he numbered among his followers the ablest men of his time. He secretly married Heloïse, the beautiful niece of Fulbert, canon of Notre Dame, who in revenge put an end to their union. A council held at Soissons in 1121 condemned Abelard's opinions on the Trinity as heretical, and soon after he withdrew to Nogent-on-the-Seine, where he built an oratory, and named it the Paraclete, or Comforter. In 1140 the pope condemned him, as a heretic, to perpetual silence. Two years after, he died.

Aben, *ah′ben,* **-Ez′ra** (1093–1168), a celebrated Jewish rabbi, born at Toledo, Spain. He was noted for his knowledge of astronomy, medicine, mathematics and philosophy, but he particularly distinguished himself as a commentator on Scripture.

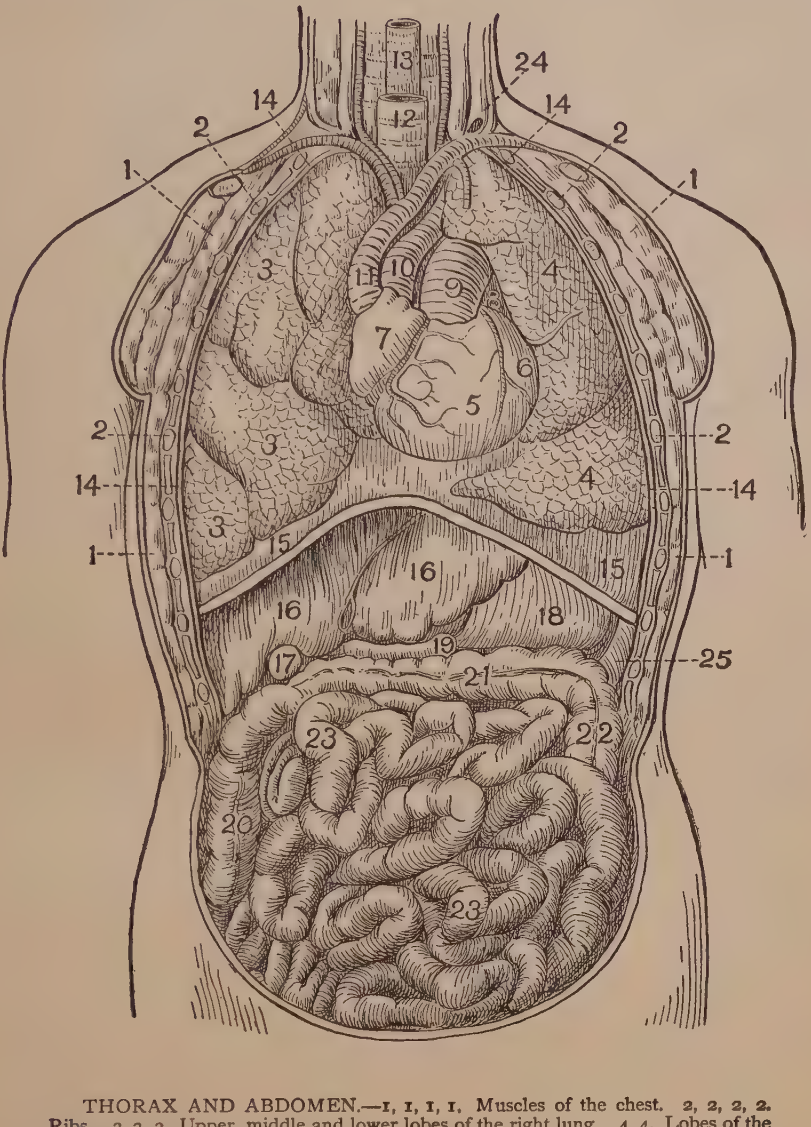
Abercrombie, *ab′er crum′by,* James (1706–1781), a British soldier. He commanded the British forces in America during the French and Indian War, was defeated at Ticonderoga and was therefore superseded the next year. After his return to England he was elected to Parliament.

Ab′erdeen′, a royal burgh of Scotland, capital of Aberdeenshire and fourth largest city of Scotland. The city is beautifully laid out and has streets which are regular and well-paved. It contains many notable buildings, chief among which are the municipal and county buildings, the Music Hall buildings, the Trades' Hall, the Roman Catholic church, Cathedral of Saint Machar and a university. The university was established in 1860 by the union and incorporation of the University and King's College of Aberdeen and the Marischal College and University of Aberdeen. Its library contains 130,000 volumes. There are also numerous other colleges and schools, among which are Gordon's College, an art school and the Mechanics' Institution. Aberdeen has an excellent harbor, which facilitates trade and which is responsible for the extensive commerce. It is a large manufacturing center, the chief industries including woolen, cotton, jute and linen factories, large soap, candle, chemical and paper works, shipbuilding yards and establishments for preparing granite for all uses. In 1336 Aberdeen was burned by the English, but was rebuilt and named New Aberdeen. Its present prosperity began in 1818, when the art of granite polishing was rediscovered. Population in 1908, estimated, 178,210.

Aberdeen, S. D., the county seat of Brown co., 280 mi. w. of Minneapolis, Minn. It is the seat of the northern normal and industrial school, one of the largest of the state educational institutions. It is a railroad, manufacturing and wholesale distributing center. Nine lines of railway extending in different directions from the city give it the nickname "Hub City." Population in 1910, 10,753.

Aberdeen, Wash., the chief city of Chehalis co., is situated at the head of nagivation on the Chehalis River and on branches of the Northern Pacific and Chicago, Milwaukee and Puget Sound railroads. It is at the head of Gray's Harbor and has an important ocean and inland trade. It is an important lumbering center, containing large sawmills, shingle mills and canning factories. Population in 1910, 13,660.

Aberdeen, John Campbell Gordon, Seventh Earl of (1847–   ), a British statesman.



THORAX AND ABDOMEN.—1, 1, 1, 1. Muscles of the chest. 2, 2, 2, 2. Ribs. 3, 3, 3. Upper, middle and lower lobes of the right lung. 4, 4. Lobes of the left lung. 5. Right ventricle of the heart. 6. Left ventricle. 7. Right auricle. 8. Left auricle. 9. Pulmonary artery. 10. Aorta. 11. Descending vena cava. 12. Trachea. 13. Oesophagus. 14, 14, 14, 14. Pleura. 15, 15. Diaphragm. 16, 16. Right and left lobes of the liver. 17. Gall cyst. 18. Stomach. 19. Duodenum. 20. Ascending colon. 21 Transverse colon. 22. Descending colon. 23, 23. Small intestine. 24. Thoracic duct opening into the left subclavian vein. 25. Spleen.

In 1876 he forsook the conservative party and cast his lot with Gladstone, who, in 1886, appointed him lord lieutenant of Ireland. In May, 1893, he was appointed governor general of Canada, where he was very popular.

Ab′erne′thy, JOHN (1764–1831). He was an eminent English surgeon, a pupil of the celebrated John Hunter. In 1787 he became assistant surgeon to Saint Bartholomew's Hospital, and was also lecturer on anatomy and surgery. In 1815 he was elected principal surgeon. His rough and eccentric ways made him a notable character wherever he was seen. He published several valuable medical works.

Ab′erra′tion, in physics, the term used to indicate the failure of rays of light to meet at a common focus when refracted by a lens or reflected by a mirror. When parallel rays of light pass through a double convex lens (See LENS), those near the edge are brought to a focus sooner than those passing through near the center. This causes the formation of an indistinct image. In optical instruments, such as the camera and telescope, this defect is remedied by the use of a diaphragm, which shuts off the edge. The diaphragm increases the distinctness of the outline of the image, but decreases its brilliancy. A large concave mirror acts in a similar manner, and the image cast upon a screen held in front of a mirror can be made more distinct by the use of a diaphragm. When the light is strong, this unequal refraction often separates the rays of light into their prismatic colors, so that we see a border of rainbow colors around the image. This is known as *chromatic* aberration. In telescopes and microscopes chromatic aberration is overcome by making the object glass of two pieces, one being of one kind of glass and the other of another. In this way each kind of glass counteracts the aberration of the other.

In astronomy, the difference between the true and the observed position of a heavenly body is called aberration.

Ab′igail, the beautiful wife of Nabal, a rich man of Carmel (*I Sam.* xxv), and afterward the wife of David. From her speech to David, her name in modern days has been applied to any female servant.

Ab′ington, Mass., a manufacturing town in Plymouth co., 20 mi. s. e. of Boston, on the New York, New Haven & Hartford railway. The place was settled about 1680 and was made a town in 1712. Population in 1910, 5455.

Ab′iogen′esis. See SPONTANEOUS GENERATION.

Abo, *aw′bo,* a seaport in Russian Finland, the capital of Finland till 1819, when it was supplanted by Helsingfors. It is one of the most important shipbuilding ports of the Russian government and is also an important trade center the chief industries being sugar refineries, cotton mills and tobacco factories. Population in 1901. 39,238.

Abolitionists, *ab′o lish′un ists,* a party which became influential during the first half of the nineteenth century in America, in favor of the immediate abolition of slavery. Its importance practically dates from the beginning of the work of William Lloyd Garrison in 1829 and the formation of the American Anti-slavery Society in 1833. The party divided soon after this time, however, Garrison and his followers advocating abolition even at the cost of disunion, while the more moderate party wished abolition through constitutional forms. They formed the Liberty party and later the Free-Soilers, and finally, in 1856, joined the Republican party. Among the prominent leaders of the radical Abolitionists were Wendell Phillips and John G. Whittier. See POLITICAL PARTIES IN THE UNITED STATES.

Abomey, *ah′bo may′,* capital, until recently, of the kingdom of Dahomey, in West Africa, near the coast of Guinea. The town is surrounded by a mud wall and a trench which encloses a large tract of land, most of which is under cultivation. An important trade in ivory, gold and palm oil is carried on. Population, about 20,000.

Aboukir or **Abukir,** *ah′boo keer′,* a small village on the Egyptian coast, 13 mi. n. e. of Alexandria. In Aboukir Bay, in 1798, took place the naval Battle of the Nile, in which Nelson annihilated a French fleet and destroyed the naval power of France in the Mediterranean. Near this place, also, in 1799 Napoleon defeated the Turks under Mustapha.

About, *a boo′,* EDMOND (1828–1885), a French novelist and political writer. He wrote in a bright, humorous and interesting style, and his novels have been very popular. The best known of them are *The Man with the Broken Ear* and *The Notary's Nose.*

Ab′racadab′ra, a meaningless word, once supposed to have magic power as an antidote against agues and fevers. It was in some cases written upon paper which was folded and worn as a charm for several days and then destroyed with great secrecy. To make it effective the word was written in this form:

ABRACADABRA
ABRACADABR
ABRACADAB
ABRACADA
ABRACAD
ABRACA
ABRAC
ABRA
ABR
AB
A

A'braham (originally Abram) the greatest of the Hebrew patriarchs, was born at Ur in Chaldea (*Gen.* xi–xxv). His two sons, Isaac (*Gen.* xviii–xxxv) and Ishmael (*Gen.* xvi and xxi), were the reputed founders of the Hebrews and Arabs, respectively.

Abra'sives, natural and artificial materials used for cutting and polishing wood, metals and stone. The most common natural abrasives are corundum, emery, sand, garnets and the varieties of rocks used for grindstones and whetstones. Other natural abrasives used to some extent are pumice, Tripoli and infusorial earth. The artificial abrasives are carborundum, crushed iron, steel and rouge. Crushed steel and steel emery are made by heating a good grade of steel to a high temperature and cooling it quickly in water, then reducing the cold steel to a powder by means of crushing machines or heavy hammers. This is then mixed with glue and applied to belts and wheels in the same manner as are emery or sand. The coarse grades of abrasives are used for cutting or rolling the material, and the finer grades for polishing. See Carborundum; Emery; Sand Blast.

Abruzzi, *a broot'sy,* Prince Luigi Amadeo of Savoy-Aosta, Duke of, (1873–), an Italian traveler and Arctic explorer, famous for his trip toward the north pole in 1900, in which he attained the highest latitude reached up to that time. This was 86° 39'.

Ab'salom, the third son of David, king of Israel. His rebellion, death, and David's touching lamentation for his son, are to be found in *II Samuel*.

Ab'sinth or **Absinthe,** an emerald-green liquor, consisting of an alcoholic solution strongly flavored with an extract of several sorts of wormwood, oil of anise and other substances. Absinth at first produces exhilaration, but its continued use leads to derangement of the digestive organs and the nervous system. Its effects are so pernicious that the French government has forbidden its use in the army and navy.

Absolu'tion, remission of a penitent's sins in the name of God. The passages of Scripture on which the Roman Catholic Church founds its doctrine of absolution are such as *Matthew* xvi, 19; xviii, 18; *John* xx, 23.

Absor'bents, the system of minute vessels by which the nutritive elements of food and other matters are carried into the circulation of vertebrate animals. See Lacteals; Lymphatics; Skin.

Absorp'tion is that property of certain organs of the body by which they take into themselves fluids of various kinds. The manner of absorption still remains a mystery so far as what the living cell itself can accomplish, independent of the physical and chemical laws. Two fluids of varying density will pass through a moist membrane and intermix; they will also pass through under pressure; they will mix when brought into direct contact with each other. In these different ways, much of the digested matter in the alimentary canal enters the blood. The current may be reversed when certain substances are taken into the stomach, as Epsom salts cause the flow of the water of the blood into the intestines. In order to be absorbed, a substance must be in the liquid or gaseous state; the less dense the substance the more rapid the absorption. Nearly all the absorption of food occurs in the small intestine, though some water, salt and sugar are taken up in the mouth and the same materials, with peptones, are taken up in the stomach. The principal organs of absorption are the *lymphatics, lacteals, blood vessels* and *skin.* See Digestion; Lacteals; Lymphatics.

Abstrac'tion, in psychology, that process by which we separate a single idea from numerous ideas in consciousness, and focus the attention upon it; as, when looking at an object, we focus the attention upon its color to the exclusion of other qualities. Abstraction first appears in a child when he notices the difference between objects. Abstraction is one of the important phases of attention, and in its highest form it constitutes one of the most advanced mental activities. In the adult mind abstraction leads to classification. See Attention; Apperception; Concept; Synthesis.

Ab'stract of Title. See Title.

Abu-bekr, *ah'boo bek'r,* (570–634), the father-in-law and first successor of Mohammed. His right to the succession was unsuccessfully contested by Ali, Mohammed's cousin, who later became the fourth caliph and started the schism which divided Mohammedans into two sects, Sunnites and Shiites.

Abukir, *ah'boo keer'*. See ABOUKIR.

Abushehr, *ah'boo sher'*, or **Bushire,** a seaport of Persia, situated on the Persian Gulf, 130 mi. s. e. of Shiraz. It is at the terminus of one of the most important caravan routes in Persia and on this account is an important commercial port, though its harbor is so shallow that it can not be entered by large vessels. The leading exports are opium, tobacco, cotton, silk, mother-of-pearl, hides and carpets, while the imports are cotton goods, metals, tea and sugar. Population, about 15,000.

Abu-simbel, *ah'boo sim'bel*, or **Ipsam'bul,** a village of Nubia, on the left bank of the Nile. It is remarkable for containing two of the most perfect and magnificent existing specimens of Egyptian rock-cut temples. The façade of one of them is adorned with several colossal sitting statues of Rameses II, the largest pieces of Egyptian sculpture yet discovered.

Abu'tilon, a troublesome weed in the middle United States, commonly known as *velvet leaf*. Other species of the same genus are cultivated in pots and in summer gardens for their pretty, bell-shaped flowers. The genus is generally tropical and belongs to the mallow family.

Aby'dos, an ancient city of Asia Minor, situated on the Hellespont, opposite Sestos. Near this place Xerxes and his army crossed over to Europe on a bridge of boats. Ancient writers say that Leander swam nightly from Abydos to Sestos to see his beloved Hero, and it is also said that Lord Byron accomplished this feat in swimming.

Abydos (now Arabat-el-Madfun), a village of Upper Egypt, about 6 mi. w. of the Nile, famous as the site of the temple of Osiris and the palace of Memnon. The ruins of both of these structures still exist. In the temple of Osiris in 1818 Mr. Bankes discovered the famous *Abydos Tablet*, containing a list of the predecessors of Rameses the Great.

Ab'yssin'ia, a country of Africa lying s. w. of the Red Sea, from which it is separated by the narrow province of Eretria. It extends from 5° 30′ to 17° north latitude, and from 36° to 42° east longitude. It is bounded on the s. by British East Africa, on the n. w. by British Sudan, on the n. e. by Eretria and French and British Somaliland, and on the s. e. by Italian Somaliland. The area is about 150,000 square miles.

SURFACE AND DRAINAGE. The main part of the country is a plateau, having an average altitude of 8000 feet. In the center is a great depression occupied by Lake Tsana, having an area of 12,000 square miles, and from which flows the Atbara. On the north are the Samen Mountains, whose average altitude is 10,000 feet. South of these is the Talba Wakha, with a somewhat lower altitude. The southern part of the country is less mountainous and somewhat rolling.

These highlands are the source of a number of important rivers, among them the Atbara and Blue Nile. With the exception of the Blue Nile, none of the streams in this region is navigable.

CLIMATE. Abyssinia is divided into three climatic areas. The first includes those portions having an altitude below 4800 feet, which possess a tropical or semi-tropical climate. The second embraces regions extending from 4800 to 9000 feet, which have a temperate climate, the average temperature being from 80° to 48°, according to altitude. The third embraces those portions of the country having an altitude above 9000 feet. Here the average temperature is from 50° to 45°. In the lowlands the rainy season is from December to May, and in the higher lands of the interior two rainy seasons prevail, the first from April to June and the second from July to October. Throughout the country the climate is healthful.

MINERAL RESOURCES. Ores of iron and silver and deposits of salt and coal are found in the mountains and on the plateau. Gold is found in the beds of the streams, and recent explorations indicate that there are rich veins in the mountains, but none of the mines has been worked.

AGRICULTURE. Agriculture is the principal industry. The land is divided among families instead of among individuals, and possession holds only during occupancy. The methods of cultivation are primitive, but the soil is fertile and yields good returns. The vegetation of the lowlands is luxuriant, and tropical fruits, sugar cane, coffee, bananas, indigo and dates are cultivated. In the middle region are found cereals, oranges, lemons, olives and fruits of the temperate region, while in the third region grazing and cultivation of the more hardy cereals, such as wheat, oats and rye, are the chief occupation. There are no manufactures worthy of mention.

COMMERCE. The commerce is limited. The imports have been restricted to bare necessities, and the exports to those commodities that can be most easily transported. A railway now extends from the Fench port of Jibutal, on the Gulf of Aden, to Harar, the chief commercial center of the country, and will be continued to Addis Abeba, the capital. This road furnishes an important outlet for the products of the region through which it passes, and will be the means of increasing the commerce. The leading foreign nations in trade with Abyssinia are Great Britain and the United States. A coin is issued by the king and is known as the Maria Theresa dollar, but bars of salt and cartridges also are used for money.

Inhabitants and Language. The Abyssinians are descendants from the Hamites and the Arabians who immigrated from Asia, but there are also numerous tribes of various nationalities, especially those that have descended from the Abyssinians and the negroes to the south. In color the Abyssinians vary from dark brown to black. They are of medium stature and of a quiet, tractable nature. The language of the court and the ruling class is Amharic, and that of the common people, Agua. In general the people are in a semi-civilized or barbarous state and use the most primitive implements and methods in their various occupations. They practice polygamy. Education is in the hands of the clergy and is limited to the merest elements of the common branches; but the people are beginning to adopt the ways of civilized nations.

Government and Religion. The government is an absolute monarchy of long standing. The ruler is called *Negus,* which means *the king of kings.* The government is supposed to observe an ancient code of Roman laws, but the king and native princes set these aside at pleasure. Local administration is in the hands of petty princes and native chiefs, each of whom supports a band of retainers to defend his territory against hostile tribes. The prevailing religion is a rude form of Christianity, which dates back several centuries before Christ, but some of the natives are Mohammedans.

History. Abyssinia is one of the oldest nations in existence. It is supposed that it is the Cush of the Scriptures, and the people believe it to have been the home of the Queen of Sheba. The ruler claims his descent from Menelek, the son of this queen and King Solomon, but good authorities consider his claims somewhat fanciful. By the spread of Mohammedanism at the close of the sixth century the people were cut off from intercourse with other countries, and as a result they relapsed into partial barbarism. In the fourteenth century the country began to regain its power and flourished for about two hundred years, when its intercourse with foreign nations was again cut off, and it remained secluded until about the beginning of the nineteenth century. In 1868 the Abyssinians were brought into conflict with the British because of depredations upon British outposts. They were thoroughly defeated and the king committed suicide. Menelek II was made king in 1889 and proved a shrewd and able administrator. In the year of the succession of King Menelik to the throne, Italy attempted to secure a protectorate over Abyssinia by force of arms. The Italians were defeated and compelled to leave Abyssinia independent. In 1908 Menelek appointed his son, Ledy Jeassu, his successor. In the same year Abyssinia became a member of the Postal Union.

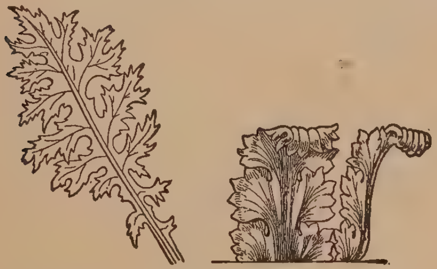
Acacia, *a ka'sha,* a genus of plants consisting of trees or shrubs with compound pinnate leaves and small leaflets, growing in Africa, Arabia and the East Indies and other tropical and subtropical countries. The flowers are arranged in spikes or globular heads, and grow in the axils of the leaves near the ends of the branches. The fruit is a dry, unjointed pod. Several of the species yield gum-arabic and other gums; some have puckery barks and pods that are used in tanning; an Indian species yields the valuable medicine called catechu. The *wattle tree* of Australia, from fifteen to thirty feet in height, is the most beautiful and useful of the species found there. Its bark contains a large percentage of tannin, and is hence exported. Some species yield valuable timber and some are cultivated for the beauty of their flowers.

ACACIA

Acad'emy, an association for the promotion of literature, science or art. The name is derived from a school which Plato taught in a grove near Athens, belonging to the Greek hero Academus. As generally used, the word now means a secondary school, or it may mean a body of men engaged in any scholarly, scientific or artistic pursuit, or even the building in which art treasures are kept or the work of the society is carried on. The French Academy, established by Richelieu in 1635, is the most noted of all the academies. As organized, it contained forty members, and its object was to control the French language and create a refined literary taste. The institution still exists very much as it was organized, and to be elected a member of it is one of the greatest honors which a literary person can receive. The first American academy was the American Philosophical Society, organized in 1744 in Philadelphia. The Academy of Natural Sciences of Philadelphia was organized in 1812. Since these were founded many other academies have been established, and before the development of the high school system these institutions, usually under the patronage of some religious society, afforded the only means of obtaining a secondary education.

Aca′dia, the name formerly given to Nova Scotia. See Nova Scotia.

Acan′thus, a genus of plants or shrubs, mostly tropical, two species of which are characterized by large white flowers and deeply indented shining leaves. They are favorite ornamental plants in gardens. In architecture the name is given to a kind of foliage decoration, much employed in Roman and later times. The conventionalized form is the characteristic decoration of the capital in the Corinthian column.


ACANTHUS
Natural Leaf and Conventionalized Leaf.

Acapulco, *ah′ka pool′ko,* a seaport on the Pacific coast of Mexico, 200 mi. s. s. w. of the City of Mexico. The region is subject to frequent earthquakes, and the town consists almost entirely of one story houses, constructed of light material. The harbor is the best on the entire Pacific coast of America. Before the construction of the Pacific railroads the town had an extensive trade with China and the West Indies, but this has now almost ceased. Most of the trade is now carried on with San Francisco. The exports are fruit, timber, indigo, cacao, hides, wool and cochineal. The population is about 5000.

Accent, *ak′sent,* an emphasis placed on a certain syllable of a word by which it is made more prominent than the other syllables. In words which contain more than two syllables there may be more than one accent, but one is always stronger than the others, and is known therefore as the primary accent, while the others are secondary, as in *syn′copa′tion.* The tendency at present in English is toward throwing the accent back towards the beginning of the word as far as euphony permits, as *incom′parable.*

In music, accent is the stress placed on certain tones in a bar of music. It falls always in the first part of the bar, and in long measures, as in words of several syllables, there may be a primary accent and one or two slight, secondary accents.

Ac′cident Insurance. See Insurance.

Accli′matiza′tion or **Ac′clima′tion,** the process by which a plant or animal adapts itself to a climate which is not natural to it. If the new species establishes itself in the new climate, the process is called *naturalization.* Cultivated plants, such as cereals, the potato and common fruits, are the best examples of acclimatization. Although in most of these the process seems to have been perfected, yet certain limitations are always appearing; for instance, corn cannot be grown in the short, cool seasons of the northern temperate regions, while wheat does not thrive as well in the warmer climates. There are countless instances of partial acclimatization, where the plant may grow thriftily for a time but fail to mature fruit or to reach the same woody structure which it possesses in its natural home.

Animals vary considerably in their power to adapt themselves to different climates. Some, such as the dog, the cat, the domestic fowls and mice, have followed man into all parts of the world and seem to thrive wherever they locate. In general, it is true that any animal organism may adapt itself perfectly to certain conditions if they are presented slowly and by degrees, while if thrown suddenly among the same conditions it will die. Man himself possesses great adaptability, yet when changes are made suddenly, he may fall prey to fatal diseases. Whenever representatives of the races inhabiting the temperate climates are transported to the tropics, they find it difficult to preserve health and vigor for any great length of time. Modern sanitation and intelligent care, however, enable these people to live for many years in hot climates, preserve their health and even carry on the industries of their first home.

Ripley's *Racial Geography of Europe*, Heilprin's *Geographical and Geological Distribution of Animals* and Ireland's *Tropical Colonization* are standard works of reference on this subject.

Accor′dion, a small wind instrument in the form of a box, from 8 to 12 inches long and 4 inches wide, containing a number of metallic reeds, which are set to vibrating by air forced into them by the folding bellows. The bellows is operated by the left hand, the right hand pressing a series of keys to regulate the pitch of the tones produced. See CONCERTINA.

ACCORDION

Account′, in a broad sense a list of items of debts or credits between one person and another. An account is said to be *mutual* when it contains demands of each of the parties against the other, as the account between two merchants, each of whom has sold goods to the other. Before an account is *rendered,* that is, before notice of it is sent from one party to another, it is said to be *open* or *current.* When it has been accepted as correct by the party against whom it shows a balance, it is said to be *stated.* This acceptance may be expressed, or it may be implied from the debtor's retaining an account rendered without objecting within a reasonable time.

Accu′mula′tor, a name applied to a kind of electric battery by means of which electric energy can be stored and rendered portable. The cells of such batteries contain grooved lead plates and lead electrodes. The grooves in the plates are filled with different substances, a paste of red lead for the positive plate and litharge for the negative plate. The plates are moistened with water containing sulphuric acid. The batteries are charged by connecting them with a dynamo, and will retain the electricity until it is required for use. Accumulators are frequently called storage batteries.

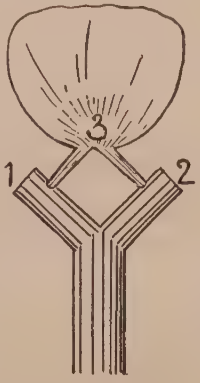
Acetanilid, *as′et an′il id,* a white crystalline powder made by treating aniline with acetic acid. It is highly poisonous, but because of its action in allaying pain it is frequently given as a medicine. It is the active and often dangerous principle in headache powders.

Acetates, *as′e tayts,* salts of acetic acid. The acetates of most commercial or manufacturing importance are those of aluminum and iron, which are used in calico-printing; of copper, which, as verdigris, is used as a color; and of lead, best known as sugar of lead. The acetates of potassium, sodium and ammonium, of iron, zinc and lead, and the acetate of morphia, are employed in medicine.

Acetic, *a set′ic,* **Acid,** an acid produced by the oxidation of common alcohol and of many other organic substances. Pure acetic acid has a very sour taste and pungent smell, burns the skin and is poisonous. Pure strong acetic acid is called *glacial acetic acid* and at temperatures below 62° F. it is a solid. Vinegar is simply dilute acetic acid, and is prepared by exposing wine or weak spirits to the action of the air. It is also obtained from malt which has undergone fermentation. Acetic acid, both concentrated and dilute, is largely used in the arts, in medicine and for domestic purposes. See VINEGAR.

Acetylene, *a set′i leen,* a pure gas consisting of carbon and hydrogen. It is clear, colorless and heavy, has a distinct odor, and burns with a flame of intense brilliancy. It is present in ordinary illuminating gas only to the extent of from ½ to 1½ per cent. The gas is poisonous to the same extent as ordinary gas, but its characteristic odor gives warning if there is any leak. There is no odor from the gas while burning, the flame being clear, white and steady, without smoke and with little heat. Acetylene gas is produced, commercially, by the action of water on *calcium carbide,* the result of *electrical fusion* of coal dust and lime in the proportion of 1130 pounds of coal dust to 1750 pounds of lime with a resultant of 2000 pounds of calcic carbide. This is a dark, gray, cinder-like substance. The calcium carbide can be exposed to the most intense heat of a blast furnace without perceptible effect. Dry air does not act upon it to any appreciable extent, although if the air is moist it reduces the gas-producing power. The instant that water is brought in contact with the carbide, acetylene gas is produced. A double change takes place. The oxygen of water unites with the calcium of the calcium carbide, forming oxide of calcium, which combines with the water, forming hydrate of calcium. The hydrogen of the water unites with the carbon of the calcium carbide, forming the acetylene, which rises and is used.

For many years acetylene gas was known as a laboratory product too expensive for anything but experimental use. A possible method of producing this gas on a commercial basis was developed in the electric furnaces of the Willson Aluminium Company, Spray, N. C., by T. L. Willson and Major J. T. Morehead, president of the company, and a geologist of national reputation. In the course of certain experiments coke and lime were fused together in the electric furnace, and the resulting products were thrown into a bucket of water. The violent bubbling, caused by the gas, directed attention to it; a match was struck, and the gas burst into a clear flame. The development of the experiments resulted in large electric furnaces being built at Niagara Falls, and calcium carbide is now a commercial product, sold directly to consumers, who with small generators make their own illuminating gas. A special burner is necessary. It contains two small openings, 1 and 2, from which the gas issues and mingles with the air before it ignites at 3.



ACETYLENE BURNER

Achaeans, *a kee′anz,* one of the four main divisions of the ancient Greeks. They migrated from Thessaly to the Peloponnesus, which they ruled in the heroic period. From very early times a confederacy existed among the twelve towns of this region. After the death of Alexander the Great it was broken up, but was revived again in 280 B. C., and from this time grew in power till it spread over the whole Peloponnesus. It was finally dissolved by the Romans in 146 B. C., and after this the whole of Greece, except Thessaly, was called Achaia or Achaea. See Greece.

Achates, *a ka′teez,* a companion of Aeneas in his wanderings after his flight from Troy. He is always distinguished in Vergil's *Aeneid* by the epithet *fidus* (faithful), and has become typical of a faithful friend and companion. See Aeneas; Aeneid.

Achelous, *ak′e lo′us,* (now called Aspropotomo), the largest river of Greece. It rises on Mount Pindus, flows southward, separating Aetolia and Acarnania, and falls into the Ionian Sea. It is 100 miles long and is not navigable. Achelous was the name of the river-god of Greece.

Acheron, *ak′e ron,* the ancient name of several rivers in Greece and Italy, all of which were connected by legend with the lower world. The best known is the Acheron in Epirus, which enters the Ionian Sea, 7 miles southeast of Parga.

Achill, *ak′ill,* or **Eagle Island,** the largest island on the Irish coast. There are several mountains rising to a height of 2000 feet. The chief occupation of the 5000 inhabitants is fishing.

Achilles, *a kil′eez,* a Greek legendary hero, the chief character in the *Iliad.* He was the son of Peleus and of the nereid Thetis, and was instructed in eloquence and the arts of war by Phoenix, and in medicine by the centaur Chiron. He joined in the war against Troy and during the early years of that struggle was of great help to the Greeks. When Agamemnon, however, took from him Briseis, a captive maiden who had fallen to his share, he refused to take further part in the war, and the fortunes of the Greeks became desperate. When his friend and kinsman, Patroclus, was killed, Achilles, led by his fierce desire for revenge, became reconciled with Agamemnon, returned to the fight and killed Hector, the bravest of the Trojan warriors. Achilles, according to early legends, had been dipped by his mother in the Styx, and thus made invulnerable except for one heel, by which she had held him. It was in his heel that he received the wound which killed him.

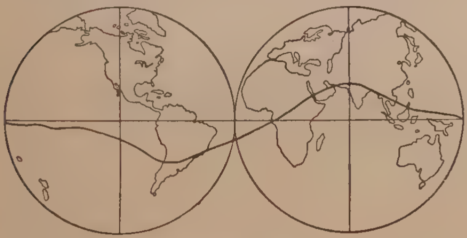
Achilles, Tendon of, the strong tendon which connects the muscles of the calf with the heel. It may be easily felt just above the heel. For the origin of the name, see Achilles.

Achin, *a cheen′,* **Atcheen,** or **Atjeh,** a town of Sumatra, in the northwestern part, on the river Achin, near the sea. It is the capital of the province of the same name. Achin has engaged in many bloody wars with the Netherlands, which claims sovereignty over all Sumatra, and its subjugation was completed only after a long struggle. Population, in 1900, about 110,000 (by some considered much larger).

Acid, *as′id,* a name popularly applied to a number of compounds, solid, liquid and gaseous, having more or less the qualities of vinegar, the general properties assigned to them being a tart, sour taste, the power of changing vegetable blues into reds and of being in various degrees neutralized by alkalies. An acid has been defined as a substance containing hydrogen, which hydrogen is in whole or in part replaceable by a metal in the form of a base; being *monobasic, dibasic* or *tribasic,* according to the number of hydrogen atoms replaced. Sulphuric acid, nitric acid and hydrochloric acid are manufactured on an extensive large scale, and are very useful products in manufactures and elsewhere. There are many organic acids which are useful and a great many more that are known principally to chemists and are prepared artificially. See Acetic Acid; Citric Acid; Carbolic Acid; Hydrochloric Acid; Nitric Acid; Sulphuric Acid.

Acireale, *ah′che ra ah′le,* a seaport of Sicily at the mouth of the River Aci near the foot of Mount Etna. It is celebrated for its mineral springs and for the grotto of Galatea and the cave of Polyphemus in the neighborhood. The manufactures are silk, linens and cottons, and there is a considerable trade in corn, wine and fruit. Population in 1901, 26,900.

Aclin′ic Line, the magnetic equator, an irregular curve in the neighborhood of the terrestrial equator, on which the magnetic needle balances itself horizontally, having no dip. See Dipping Needle.



ACLINIC LINE

Aconcagua, *ah′kon kah′gua,* an extinct volcano of the Argentine Republic, in the southern part of the Andes. It is usually considered the highest mountain in America, its height being estimated at 23,000 feet. It was first ascended in 1897 by Zurbriggen. A river of the same name, 200 miles in length, rises on the southern slope of the mountain and enters the Pacific.

Ac′onite, a genus of hardy herbs represented by the well known *wolf's-bane* or *monk's-hood,* and remarkable for their poisonous properties and medicinal qualities. Aconite acts upon the heart to lessen its action, and in fatal doses it kills by paralyzing the heart.

Aconquija, *ah kon ke′ha,* a range of mountains in the Argentine Republic; the name, also, of a single peak, 17,740 feet high. The range is rich in metals.

Acoustics, *a kow′stiks* or *a koo′stiks.* See Sound.

Acre, *a′kur,* a standard measure of land, used in the United States and England. The acre consists of 4840 square yards, is divided into 4 roods and each rood into 4 perches. It is approximately equal to .404 hectares.

Acre, *ah′kur* or *a′kur,* or **Ak′ka,** a city and seaport of Syria, at the foot of Mount Carmel. In ancient times it was a place of great importance, and it is famous for many sieges. In 1104 it was taken by the Crusaders, and in 1187 by the Saracens, and was recovered by Richard Coeur de Lion and given to the Knights of Saint John of Jerusalem. Again, in 1291, it was taken by the Saracens. Bonaparte attempted to take Acre in 1799, but the siege proved unsuccessful. In 1832 it was taken by Ibrahim Pasha and was bombarded by the English and Austrians in 1840.

Ac′robat, a term applied to any person skilled in rope-walking, balancing or tumbling acts. Acrobats have entertained the public for centuries with their remarkable performances, though doubtless never by greater skill or more wonderful evolutions than are now practiced. All exercises with apparatus in gymnasiums are now known as acrobatic performances.

Acrop′olis, the citadel or chief place of a Grecian city, usually on an eminence commanding the town. That of Athens, the best example, contained some of the finest buildings in the world. See Parthenon; Erechtheum; Temple of Nike Apteros; Propylaea; Theseum.

Acros′tic, a poem of which the first or last, or certain other letters of the lines, taken in order, form some word, name, motto or sentence, as in the following:

T ruth as refined as ever Athens heard, that wakes
 to perish never;
H ope like the gleaming taper's steady light,
I ncite our hearts to noblest thought and word
 and deed and best endeavor;
N umberless blessings truth and hope impart,
 sweet melodies inspiring;
K indling the soul with zeal to do the right, in
 virtues never tiring.

A poem of which both first and last letters are thus arranged is called a *double acrostic*. In Hebrew poetry, the term is applied to a poem of which the initial letters of the lines or stanzas were made to run over the letters of the alphabet in their order, as in *Psalms* CXIX. Acrostics have been much used in complimentary verses, the initial letters giving the name of the person eulogized.

Actaeon, *ak tee′on,* in Greek mythology, a great hunter who was turned into a stag and was torn to pieces by his own dogs, for looking on Diana when she was bathing.

ACTAEON AND HIS DOGS
British Museum.

Ac′tinism, the chemical action caused by light. When sunlight is resolved into its spectrum (See LIGHT, subhead SPECTRUM), it is found that the different rays possess the power of producing chemical changes in a varying degree. The most rapid changes occur in the violet rays and the dark space just beyond, while the red rays have little power to cause chemical action. The varying chemical power of the different rays can be shown by directing a spectrum on to a sheet of white paper moistened with a solution of nitrate of silver. The shading will decrease in intensity from the portion on which the violet rays fall to beyond the red rays, where little or no change can be detected. Practical applications of this property of light are made in the arts. Photographers use a red light in the developing room, since its rays will not affect the undeveloped negatives. Horticulturists sometimes use blue or violet glass for covering hot-houses or hotbeds in which they wish plants to grow rapidly. The blue and purple rays are also used by physicians in treating certain diseases, and recent research has shown that the blue rays are very effective.

Ac′tion, in law. See PROCEDURE.

Actium, *ak′shium,* (now **Ak′ri**), a promontory on the western coast of Northern Greece, memorable for the naval victory gained here by Octavianus (afterward the Emperor Augustus) over Antony and Cleopatra, 31 B. C. Cleopatra fled with sixty Egyptian ships, and Antony followed her to Egypt. The deserted fleet was overcome after a brave resistance. Antony's land forces went over to the enemy.

Acts of the Apostles, one of the books of the New Testament, written in Greek, probably in 63 or 64 A. D., and usually attributed to Saint Luke. It embraces a period of about thirty years, beginning immediately after the Resurrection and extending to the second year of the imprisonment of Saint Paul in Rome.

Ac′upunc′ture, a surgical operation, consisting of the insertion of needles into certain parts of the body for the purpose of alleviating pain, or for the cure of rheumatism, neuralgia and other diseases. It is easily performed, gives little pain, causes neither bleeding nor inflammation and seems at times to be of surprising efficacy.

Adam and Eve, the names given in Scripture to our first parents, an account of whom and their immediate descendants is given in the early chapters of *Genesis.*

Ad′ams, MASS., a town in Berkshire co., 16 mi. n. of Pittsfield, on the Hoosac River and the Boston & Albany railroad. It has a public library and contains manufactures of cotton and woolen goods, foundry products and other articles. Greylock Mountain, which has an elevation of 3535 feet and is the highest point in Massachusetts, lies within the limits of the town. It was laid out in 1749 as East Hoosuck and incorporated under its present name in 1778. Population in 1910, including the villages of Renfrew, Maple Grove and Zylonite, 13,026.

Adams, Charles Francis (1807–1886), an American statesman, son of John Quincy Adams. His early years were spent in Europe, but he finished his education at Harvard, and afterward studied law. After serving some years in the Massachusetts legislature, he was elected to Congress in 1858. In 1861 he was sent to England as American minister, and for seven years he performed the arduous duties of his office with the utmost tact and ability. He was one of the arbitrators of the Alabama claims.

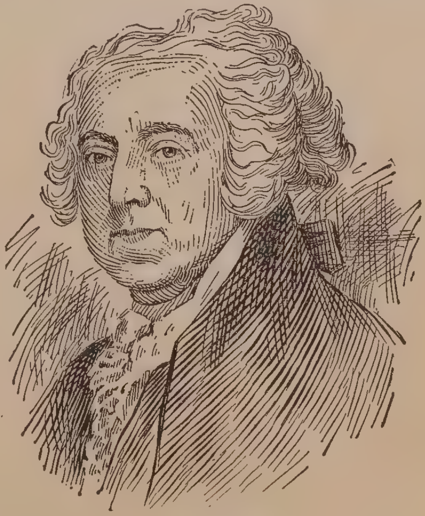
Adams, Charles Francis, Jr. (1835–), an American author and statesman, born in Boston. He graduated at Harvard in 1856 and was admitted to the bar in 1858. He served in the Union army and was made brigadier general at the close of the war. In 1869 he was appointed to the board of railroad commissioners for Massachusetts, and in 1884 he became president of the Union Pacific railway, a position which he filled for six years. He published *Chapters of Erie; Notes on Railway Accidents,* and *Massachusetts: Its Historians and Its History,* besides much other work of a miscellaneous character.

Adams, Charles Kendall (1835–1902), an American educator and historian, born at Derby, Vermont. He was educated in the University of Michigan and in universities in Germany, France and Italy. In 1885 he was elected president of Cornell University, where he served for seventeen years. He resigned this position and in 1893 was chosen president of the University of Wisconsin, which position he held until a short time before his death. Doctor Adams was the founder of the seminary of history in the University of Michigan, and the first to introduce the seminary method of studying history into the United States. He is the author of a number of works, the most important being *Democracy and Monarchy in France, A Manual of Historical Literature* and *Columbus, His Life and Work.* He was also editor-in-chief of *Johnson's Universal Encyclopedia.*

Adams, Henry (1838–), an American historican, son of Charles Francis Adams. He was professor of history at Harvard from 1870 to 1877, and was most successful in his work there. He has published several historical works, most important of which is the *History of the United States from 1801 to 1817.* The life of John Randolph in the American Statesmen Series was written by him.

Adams, Herbert Baxter (1850–1901), an American historian, born near Amherst, Mass. He studied at Amherst College and Heidelberg, Germany, and became connected with Johns Hopkins University, where he rose to a professorship of history. He edited the well-known *Johns Hopkins Studies in History and Political Science,* wrote many important essays, mainly on educational history, and is known for a two volume life of Jared Sparks He was a lecturer at Smith College and at Chautauqua, was much interested in university extension and helped to found the American Historical Association. His best work was in training students of history and encouraging historical research.

Adams, John (1735–1826), second president of the United States, born at Quincy, Mass. He was educated at Harvard University and adopted the law as a profession. In 1764 he married Abigail Smith, a woman of considerable strength of character, who had much influence on her husband's life. Adams's attention was directed to politics by the question as to the right of the English Parliament to tax the colonies, and in 1765 he published some essays strongly opposed to the claims of the mother country. As a member of the Continental Congress he was strenuous in his opposition to the home government, and in organizing the various departments of the colonial government. On May 13th, 1776, he seconded the motion for a


JOHN ADAMS

declaration of independence proposed by Lee of Virginia and was appointed a member of the committee to draw it up. The declaration was actually drawn up by Jefferson, but it was Adams who carried it through Congress.

THE ADAMS HOUSES, QUINCY, MASS.
John Adams was born in the house to the right, John Quincy Adams in the house to the left.

In 1778 he went to France on a special mission, and after a brief home visit returned to Europe. For nine years he resided abroad as representative of his country in France, Holland and England. After taking part in the peace negotiations he was appointed, in 1785, the first ambassador of the United States to the court of Saint James.

He was recalled in 1788, and in the same year was elected vice-president of the republic, under Washington. In 1792 he was reëlected vice-president, and at the following election was chosen president. The commonwealth was then divided into two parties, the Federalists, who favored strong central government and were suspected of monarchic views, and the Anti-federalists, Republicans or Democrats. Adams adhered to the former party, but the real leader of the party was Hamilton, with whom Adams did not agree and who tried to prevent his election. His term of office proved a stormy one, and broke up the Federalist party. His reëlection in 1800 was opposed by Hamilton, who succeeded in effecting the return of the Democratic candidate, Jefferson. Adams then retired from office into private life. He had the consolation of living to see his son president. He died July 4, 1826, the fiftieth anniversary of the declaration of independence, and on the same day as Jefferson. His works have been ably edited by his grandson, Charles Francis Adams.

Adams, John Quincy (1767–1848), sixth president of the United States, son of John Adams, the second president. He was born at Quincy, Mass., accompanied his father to Europe and was educated there in part, but graduated at Harvard in 1788. He was admitted to the bar and soon began to take an active interest in politics. His published letters on public issues having attracted general attention, in 1794 he was appointed by Washington minister to The Hague. He afterward was sent to Portugal, and by his father to Berlin. Adams entered the state Senate and was elected by the Federalists to the United States Senate from Massachusetts in 1803. During this service he became a warm follower of the Republican administration and thus incurred the displeasure of his constituents to such an extent that he resigned in 1808, and in 1809 went as ambassador to Russia. He assisted in negotiating the peace of 1814 with England and was afterward appointed resident minister at London. Under Monroe he was secretary of state, and in that capacity had much to do with framing the famous Monroe Doctrine.

JOHN QUINCY ADAMS

At the expiration of Monroe's double term of office he succeeded him in the presidency (1825) as the candidate of the so-called National-Republicans, those Republicans who favored protection and internal improvements. Little was accomplished during his administration except the passage of a protective tariff law in 1828, known as the "Tariff of Abominations" (See Tariff). He was not able, as president, to satisfy any one of the numerous political factions, and was not reëlected. In 1830 he returned to the lower house of Congress and continued to represent his state with remarkable ability till his death, his efforts being chiefly in behalf of the abolitionist party. This is the only case in which an ex-president has served in Congress.

Adams, Maud Kiskadden (1872–), an American actress, born in Salt Lake City, Utah. In the companies of which her mother was a member, Maud Adams often appeared while a child, and at sixteen years of age she joined Sothern's company As a member of Frohman s stock company her reputation grew steadily and with her presentation of Lady Babbie in *The Little Minister,* a dramatization of Barrie's novel, she scored a great success. As Juliet, and as the Duc de Reichstadt in *L'Aiglon,* she gained increased popularity, to which her productions of Barrie's *Quality Street* and *Peter Pan* added.

Adams, Samuel (1722–1803), an American statesman, second cousin of John Adams. He early devoted himself to politics, and in the dispute between America and the mother country he showed himself one of the most unwearied, efficient and disinterested laborers for American freedom and independence. He was one of the signers of the declaration of 1776, which he labored most indefatigably for several years to bring forward. He sat in Congress eight years, but during that period showed a lack of depth of view and legislative wisdom. From 1789 to 1794 he was lieutenant governor of Massachusetts, from 1794 to 1797 was governor, and then retired from public life.

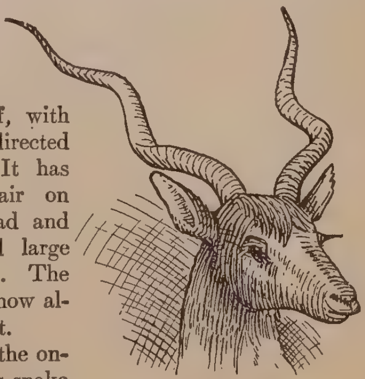
Adams, William Taylor (1822–1897), American author of juvenile stories, better known by his pseudonym, Oliver Optic. He taught for twenty years in Boston, and was once a member of the state legislature. His works comprise over one hundred volumes, of which may be mentioned the Young America Abroad Series; The Boat Club Series and The Starry Flag Series.

Adam's Apple. See Larynx.

Ad'dams, Jane (1860–), an American social settlement worker, born at Cedarville, Ill. She graduated at Rockford Seminary, studied in Philadelphia, traveled in Europe and in 1889 established the Hull House social settlement in Chicago, becoming its head resident. Her energy and ability and her sympathy with the dwellers in the slums soon brought the settlement to prominence and made it the leading institution of its kind in the United States. Miss Addams early became a frequent contributor to magazines and wrote several books, of which the best known is *Democracy and Social Ethics.*

JANE ADDAMS

Ad'dax or **Ad'das,** a species of antelope of northeastern Africa. The horns of the male are about four feet long, beautifully twisted into a wide sweeping spiral of two turns and a half, with the points directed outward. It has tufts of hair on the forehead and throat, and large broad hoofs. The animal is now almost extinct.



ADDAX

Ad'der, the only poisonous snake of Great Britain. The name, however, is generally applied to the viper and to almost any poisonous snake. The name is derived from the serpent's power of puffing out the upper part of its neck when irritated or alarmed. The *puff adder* or *asp* is a snake of South Africa whose bite is always fatal. It is very thick and attains a length of four or five feet. The natives poison their arrows with its venom.

Ad′dicks, John Edward (1841–), an American capitalist and politician, born in Philadelphia. He early entered business and organized and became the chief stockholder in several large corporations, notably the Bay State Gas Company of Boston and the Brooklyn, N. Y., Gas Company. In 1895 he first made a serious effort to gain political office, being a prominent candidate for United States senator in Delaware. Though defeated, he prevented the election of his rival, and for about eight years Delaware was represented by only one senator and part of that time had no senator at all. During his many campaigns Addicks gained an unenviable reputation for corruption and political intrigue.

Addis Abeba, *ah′dis a ba′bah,* the capital of Abyssinia, in the province of Shoa, situated at an altitude of over 8,000 feet. This city was the scene of the signing of the treaty of peace between Italy and Abyssinia in 1896, in which Italy resigned her claim to a protectorate. Population, estimated at 50,000.

Ad′dison, Joseph (1672–1719), an English poet and essayist, born at Milston, in Wiltshire. He studied at Oxford and won a name for himself by his easy, graceful Latin verse. After his graduation he was given a pension by the government, which enabled him to travel on the continent for several years. While in Italy he penned his poetical *Letter* to Lord Halifax. In 1704 he wrote *The Campaign,* a poem addressed to the duke of Marlborough, celebrating his victory at the battle of Blenheim, and this secured him several government appointments. He commenced to write for the *Tattler* in 1709 and for its successor, the *Spectator,* in 1711. His tragedy of *Cato,* produced in 1713, met with great success. His marriage to the dowager countess of Warwick occurred in 1716, but he gained little happiness from the union. Of Addison's poetry one or two sacred pieces will endure as long as the language; but it is by his essays in the *Spectator* that he is best known. For humor and poetic grace, for elegance of style and for good-humored satire, these essays remain unsurpassed. Best known is the delightful series on *Sir Roger de Coverley,* with its excellent character-drawing.

Addition, *ad dish′un.* See Arithmetic.

Address′, Forms of, in the United States are not so rigidly observed as in monarchical countries and are less formal and elaborate. The Constitution of the United States provides that no title shall be granted by the government and that no official of the United States shall accept a title from any foreign state. The president of the United States and the governor of Massachusetts possess by legislative act the title *Excellency* and the same title is usually given by courtesy to governors of other states. In addressing the president or a governor in writing or in speaking of him formally, the form used is, *His Excellency the President of the United States* or *His Excellency the Governor of* ——.

The vice-president of the United States, the heads of executive departments, the justices of supreme and superior courts, lieutenant governors of states, mayors of cities and senators and representatives of the United States and of the several states are addressed as *The Honorable* ——, to which is usually added the official title as, *The Honorable* —— ——, *Chief Justice of the Supreme Court of the United States.*

Archbishops are addressed *The Most Reverend* ——, *Archbishop of* ——. A cardinal is addressed *His Eminence* ——, *Cardinal Archbishop of* ——.

Roman Catholic or Episcopal bishops are addressed *The Right Reverend.*

GEORGE ADE

Ade, George (1866–), an American humorist, playwright and author, born at Kentland, Ind. He graduated at Purdue University and did newspaper work in Lafayette, Ind., and in Chicago, where he became known for his sketches of street-life. Among other books, he published two volumes of *Fables in Slang*, remarkable for their wit and knowledge of human failings. Of his later works, *The Sultan of Sulu*, *Peggy from Paris* and *The Sho-gun* are light operas, marked by the same qualities as his earlier works; and he has exhibited the same characteristics in several popular comedies, including *The College Widow*, *The County Chairman* and *Just Out of College*.

Ad′elaide, the capital of South Australia, on the Torrens River, 7 mi. from the coast and 508 mi. n. w. of Melbourne. The Torrens has been enlarged by damming a lake in its vicinity and is crossed by a number of beautiful bridges. The most important buildings are the Parliament buildings, costing nearly half a million dollars, the town hall, the South Australia Institute, library and art galleries. The city also has a beautiful botanical garden and other parks. It is the see of a Catholic and Anglican bishop and contains a large number of churches. The chief industries are iron foundries, woolen mills, soap and starch factories, tanneries and breweries. Lead and copper are mined in the vicinity, and the city carries on a large trade. Adelaide was founded in 1836 and was named after the queen of William IV. Population in 1908, including suburbs, estimated, 179,793.

Port Adelaide, the port of the city, which is seven miles distant, has an excellent harbor and is the port of call for nearly all European vessels. Population, about 5000.

Ad′eler, Max. The pen name which Charles Heber Clark (1841-), journalist and writer, who was born at Berlln, Md., and educated at Georgetown, D. C., used in his popular humorous sketches. *Out of the Hurly Burly* contains much of his best work. See Clark, Charles Heber.

Aden, *ah′den* or *a′den*, a seaport town and territory on the southwest coast of Arabia, belonging to Great Britain. Occupying an important military position, Aden is strongly fortified and permanently garrisoned, and may be called the Gibraltar of the East. It is situated in the crater of an extinct volcano and is surrounded by rocky peaks, which attain a height of from 1000 to 1775 feet. The harbor is deep and commodious and Aden is one of the most important coaling stations on the route of vessels passing through the Suez Canal. The commerce is extensive and the town is the chief trading port on the coast of Arabia. Population in 1901, 43,974.

Aden, Gulf of, that portion of the sea lying between Arabia and Aden and extending from the strait of Bab-el-Mandeb to the Indian Ocean, or Arabian Sea. It is sometimes known as the Arabian Gulf. The length is 500 miles.

Adhe′sion, the attraction which different substances have for each other when brought into close contact. It is by adhesion that chalk sticks to a blackboard, paint to wood, and the lead of a pencil to paper. Adhesion may also exist between two solids, between a solid and a fluid, or between two fluids. A plate of glass or of polished metal laid on the surface of water and attached to one arm of a balance will support much more than its own weight in the opposite scale from the force of adhesion between the water and the plate. From the same force arises the tendency of most liquids, when gently poured from a jar, to run down the exterior of a vessel or along any other surface they meet.

Adige, *ah′de ja*, (German, Etsch). a river of northern Italy, which rises in the Rhaetian Alps, and after a south and east course of about 180 miles, during which it passes Verona, Avisio and Alpone, falls into the Adriatic, forming a delta connected with that of the Po. Its total length is 230 miles, of which 170 are navigable, though with difficulty.

Adiron′dack Mountains, a group of mountains belonging to the Appalachian system, extending from the northeast corner of the State of New York to near its center. The scenery is wild and grand, diversified by numerous beautiful lakes, and the whole region is a favorite resort of sportsmen and tourists. The district has been preserved in its natural beauty by state legislation constituting it a public park.

Ad′jective, in grammar, the part of speech which is used to limit or define a noun or a word or phrase equivalent to a noun. One of the more common classifications of adjectives divides them into (1) descriptive adjectives, which include not only adjectives denoting quality, as *white, round, good,* but also numeral adjectives, as *one, two;* (2) pronominal adjectives, as *this, that.* In this latter class the articles are sometimes included (See Article). In the English language the adjective always precedes its noun unless it be a predicate adjective. English adjectives do not change their form for gender or number, but the adjectives of quality admit of comparison to express various degrees of the quality indicated.

Ad′jutant, a species of stork common in India, where it is protected by law because of its habit of destroying small noxious animals and acting as a scavenger. The adjutant has a slate-colored back and wings, with white body and a nearly naked flesh-colored neck marked with black. It stands about five feet high and has an enormous bill and an inflatable pouch under its neck. It was called adjutant bird because of the important ways it assumes.

ADJUTANT

Ad′ler, Felix (1851–), an American lecturer and educator, born at Alzey, Germany, and educated at the universities of Berlin and Heidelberg. On completion of his education he was appointed professor of Hebrew and oriental literature at Cornell University, but is more generally known as the founder in New York of the Society for Ethical Culture, of which he became the lecturer. Under Doctor Adler's management the influence of this society became such as to secure the establishment of similar societies in other parts of the United States and in foreign countries. In 1902 Doctor Adler was appointed professor of social and political ethics in Columbia University. He was the author of *Creed and Deed* and *The Moral Instruction of Children.*

Adme′tus, in Greek mythology, king of Pherae, in Thessaly, and husband of Alcestis, who gave signal proof of her attachment by consenting to die in order to prolong her husband's life. See Alcestis.

Ad′miralty Island, an island 80 miles long off the coast of Alaska, just south of Juneau. It is separated from the mainland by a narrow channel and is covered with excellent timber. The inhabitants are Sitka Indians.

Admiralty Islands, a cluster of about forty islands north of New Guinea, belonging to Germany. The largest is about 60 miles in length. They possess dense groves of cocoanut trees and are covered with rich vegetation. They were discovered in 1616.

Ado′be, the name of a sun-dried brick used in arid regions in Arizona, New Mexico and Mexico. The bricks are baked by exposing them to the sun for ten days or two weeks, during which time they are turned daily. They are of two sizes, 18 × 9 × 4 inches, and 16 × 12 × 4 inches. When dried, the bricks are stacked for use. The large size are so laid in walls that the length of the brick will be crosswise, while the smaller size are laid lengthwise of the wall. These bricks are serviceable for building in dry climates, but they cannot be used where there is much rainfall. Bricks made in a similar manner were used by the ancient Egyptians and Babylonians in constructing most of their buildings.

Ado′nis, a genus of plants of the same family as the buttercup. In the corn-adonis or pheasant's eye the petals are bright scarlet like the blood of Adonis, from which the plant is fabled to have sprung.

Adonis, in classical mythology, a beautiful boy who was loved by Venus. He was killed during a boar hunt, and Venus, inconsolable, begged Proserpina for his return from the lower regions, and it was finally granted that the boy should spend half of the year on earth.

Adrian, the name of six popes of Rome, no one of whom was noted for any great deeds. Adrian IV, originally named *Nicolas Breakspear*, the only Englishman that ever occupied the papal chair, was born about 1100 and died 1159. He studied in France, became abbot of St. Rufus in Provence, and pope in 1154. During his reign was begun the long contest with the German House of Hohenstaufen, which finally brought about the overthrow of that dynasty. Adrian V settled the dispute between King Henry III of England and his nobles in favor of the former, but died a month after his election to the papal chair (1276).

A′drian, Mich., the county-seat of Lenawee co., 70 mi. s. w. of Detroit, on the Raisin River, and on the Lake Shore & Michigan Southern, the Wabash and other railroads. It is the seat of Adrian College, the state industrial home for girls and Saint Joseph's Hospital and Academy. The city has a large trade in farm produce, and contains manufactures of wire fences, electrical supplies, pianos, organs, mail boxes and other articles. It was settled in 1825 and was chartered as a city in 1853. Population in 1910, 10,763.

A′driano′ple, the most important military post of European Turkey, situated about 135 mi. n. w. of Constantinople. The chief buildings are a great mosque, a palace now in ruins, a grand aqueduct and a splendid bazaar. The manufactures are silk, woolen and cotton stuffs, attar of roses and leathers. Adrianople was founded by the emperor Hadrian and was the capital of the Ottoman Empire from 1361 to 1453. Here was signed in 1829 a treaty between Russia and Turkey, in which the latter power recognized the independence of Greece. Population, about 70,000, although formerly much greater.

A′driat′ic, or *ad′re at′ic*, **Sea,** THE, an arm of the Mediterranean, stretching in a northwesterly direction from the Straits of Otranto, between Italy and the Turkish and Austrian dominions. Its length is about 480 miles, its average breadth about 100 miles, and its area about 60,000 square miles. In the north it forms the Gulf of Venice and in the northeast the Gulf of Trieste. The Po River has carried so much silt into the sea that cities once on its coast are now inland

Adul′lam, CAVE OF, a cave to which David fled when persecuted by Saul. See *I Sam.* XXII, 1, 2.

Adul′tera′tion, a term used by magistrates and analysts not only in its proper sense, of fraudulent mixture of articles of commerce with noxious or inferior ingredients, but also applied to accidental impurity, and even, in some cases, to actual substitution. The chief objects of adulteration are to increase the weight or volume of anything, to give a color which pleases the eye or disguises an inferior article, to substitute a cheaper form for a dearer, or to give it a false strength. Bread is adulterated with alum or sulphate of copper, which gives solidity to the gluten of inferior flour; with chalk or carbonate of soda to correct the acidity of such flour, and with boiled rice or potatoes, which enables the bread to carry more water and thus to produce a larger number of loaves from a given quantity of flour. Milk is usually adulterated with water. The adulterations generally present in butter consist of an undue proportion of salt and water, lard, tallow and other fats. Genuine butter should not contain less than 80 per cent of butter-fat. Tea is adulterated (chiefly in China) with sand, iron-filings, chalk, gypsum, China clay, exhausted tea leaves and the leaves of the sycamore, while color and weight are added by black-lead, indigo, Prussian-blue, gum, turmeric, soapstone and other substances. Mixed with ground coffee are ground chicory, roasted wheat, roasted beans, acorns and rye, while the mixture is colored with burned sugar and other materials. Chicory is adulterated with different flours and colored with such substances as burned sugar and Venetian red. Tobacco is mixed with sugar and treacle, aloes, liquorice, oil and alum, and such leaves as rhubarb, chicory, cabbage and burdock. Confections are adulterated with flour and sulphate of lime. Pepper is adulterated with linseed-meal, flour, mustard and husks. Color is given to pickles by salts of copper. Brandy is diluted with water, and burned sugar is added to improve the color; gin is mixed with excess of water, and flavoring matters are added. For champagne, gooseberry and other inferior wines are often substituted. Medicines, such as jalap, opium, rhubarb, aloes, sarsaparilla and squills, are mixed with various foreign substances. Castor-oil has been adulterated with other oils; and inferior oils are often mixed with cod-liver oil. The adulteration of seeds is largely practiced. Thus, turnip-seed is mixed with rape, wild mustard or charlock. Clover-seed is also much mixed with the seeds of the plantain and mere weeds.

Laws against adulteration have been passed in various countries and at various times, and the tendency now is to be severe in assigning penalties, especially to such forms of adulteration as may be a menace to public health.

Ad′ventists, several religious sects which, accepting the general doctrines of Christianity, expect a second personal coming of Christ and the early end of the world. All arose from the preaching of William Miller, who began in 1831 to prophesy the end of the world and the establishment of Christ's kingdom in 1843. Since the passing of that date the Adventists have been simply waiting for the appearance of Christ and make no attempt to fix the date. The Adventists are now separated into a number of different sects, of which the Church of God, the Evangelical Adventists, the Age-to-

Come Adventists and the Life and Advent Union are small and local. The Advent Christians, who number more than 26,000, have over 600 churches and sustain foreign missions in England and Asiatic countries. *The World's Crisis* and *All Nations, Monthly* are their leading publications. The largest sect dates from a meeting held at Washington, New Hampshire, in 1845. See SEVENTH DAY ADVENTISTS.

Ad′verb, in grammar, the part of speech which is used to limit or modify a verb, an adjective or another adverb. Adverbs may be classified as follows: (1) adverbs of place, as *here, there;* (2) of time, as *now, again;* (3) of number, as *once, first;* (4) of manner, as *how, well;* (5) of degree, as *very, more;* (6) of cause, as *why;* (7) of assertion or denial, as *yes, no.* The largest class of adverbs in English is formed from adjectives by the addition of the syllable *ly,* as *slow, slowly.* Adverbs do not change their form in comparison, as do adjectives, but are compared by the use of *more* and *most.*

Ad′verti′sing, *ad′ver ti′zing,* a method by which a producer makes known the merits of his product. This branch of business is of ancient origin, having been traced back to ancient Palestine, Greece and Rome, but in its modern form and extent it is of comparatively recent date. It has two purposes: for the benefit of the producer, to create a demand for his goods; for the benefit of the purchaser or consumer, to bring to his knowledge the virtues of commodities whose use will be of advantage to him. It has had its greatest growth in the United States and is most widely carried on through newspapers and magazines. It has been estimated that more than $500,000,000 are spent upon advertising in the United States each year. Besides the newspapers and magazines, the mediums most commonly used are catalogues, booklets, circulars, handbills; street advertising by means of signs and billboards, and salesmen. The importance of advertising has become so generally acknowledged that it practically constitutes a new and separate branch of modern business, thousands of men connected with every line of production and distribution being engaged only in the advertising of their special products or methods. The most recent development is the establishment of schools for the training of advertisement writers.

Adz, a tool used by carpenters for smoothing timber. It has an edge shaped like a chisel and from four to five inches long. The head is curved and has a socket for the handle, which is straight and about three feet long. The line of the edge is crosswise to that of the handle. The cooper's adz has a short handle and is used with one hand. An adz used for making eave-troughs and hollow ware has the blade shaped like a gouge.

ADZ.

Aegean, *e je′an,* **Sea,** that part of the Mediterranean which washes the eastern shores of Greece, the southern coast of Turkey and the western coast of Asia Minor. Its length is about 400 miles and its breadth 175 miles at the widest point. It contains numerous islands, many of which are of volcanic origin. The chief ones are Euboea, Chios, Lesbos, Lemnos and Samos.

Aegina, *e ji′na,* a Greek island in the Gulf of Aegina. It is about 8 miles long and the same in breadth. Except in the west, where the surface is more level, the island is mountainous and unproductive. The inhabitants are chiefly engaged in trade, seafaring and agriculture, and the chief crops are almonds, olives and grain. Aegina was especially celebrated in ancient times for its beautiful buildings, among which was the temple of Jupiter on Mount Saint Elias. Population, about 9,000.

Aegis, *e′jis,* according to Homer, the shield of Jupiter. It was borne either by Jupiter or by Minerva, and according to some legends had the gorgon's head fastened in its center. When Jupiter was angry he shook the aegis and its thunder was heard on earth.

Ae′gospot′ami (goat-river), a place on the Hellespont in the Thracian Chersonese, where the Athenian fleet was completely defeated in 405 B. C. by the Spartan Lysander. This victory ended the Peloponnesian War.

Aene′as, a Trojan warrior who, according to Homer, was next to Hector in bravery and in prominence during the Trojan War. The account of his wanderings after the fall of his city forms the theme of Vergil's *Aeneid.* See AENEID.

Aene′id, the great Roman epic poem, by Vergil. It is divided into twelve books, of which the first six are modeled to some extent upon the *Odyssey,* the last six upon the *Iliad.* The gods are represented as taking part in the affairs of men, and as being divided in their councils respecting the fate of mortals. Indeed, it is the hatred of Juno that brings upon Aeneas all his woe, while Venus toils to thwart the plans of the hostile goddess and bring her beloved Trojans to Latium. Summarized briefly, the story is as follows: The hero appears, in the sixth year of his wanderings, sailing from Sicily. Juno succeeds in bringing about a terrible storm, during which Aeneas is shipwrecked upon the coast of Africa. He is kindly received by Dido, queen of Carthage, and to her relates the story of the fall of Troy, the burning of the city, his escape to Mount Ida and his varied wanderings and perils until at last he reached Sicily, where he buried his father, Anchises, whom he had carried on his shoulders from the burning city. By the strategems of Venus, Dido is made to fall in love with Aeneas, to whom she offers her hand and crown. Obeying the command of the gods, the hero leaves Carthage, and Dido, in rage and despair, dies by her own hand. Aeneas sails for Italy, but is driven ashore in Sicily, where he institutes games at his father's tomb. The fleet is set on fire by the Trojan women, but is saved by Jupiter and Aeneas continues his voyage and reaches Italy. Here he visits the Sibyl of Cumae, who conducts him down to the infernal regions, where his father Anchises tells him of the fate in store for him and his descendants, the Romans. After reaching Latium, his destination, Aeneas makes a treaty with Latinus, king of the region about the mouth of the Tiber, and is promised his daughter, Lavinia, in marriage. Juno interferes to break the treaty and brings on a war with the neighboring kings, in which the Trojans are at length victorious. From Aeneas, according to Vergil, was descended the Julian family of Rome, of which Augustus, in whose honor the poem is written, was a member.

Aeo′lian Harp, a musical instrument, generally consisting of a box of thin fibrous wood, to which are attached from eight to fifteen fine catgut strings or wires, stretched on low bridges at each end, and tuned in unison. Its length is made to correspond with the size of the window or other aperture in which it is intended to be placed. When the wind blows across the strings, it produces beautiful harmonies of sound, swelling or diminishing according to the strength or weakness of the blast.

Ae′olus, in Greek mythology, the god of the winds, which he kept confined in a cave in the Aeolian Islands, releasing them when he wished or when he was commanded by his superiors among the gods.

A′erolite. See METEOR.

A′eronaut′ics. See BALLOON and FLYING MACHINE.

A′erostat′ic Press, a simple contrivance for rendering the pressure of the atmosphere available for extracting the coloring matter from dye-woods, and for similar purposes. A horizontal partition divides the machine into two parts. The lower part is connected with an air-pump, by means of which the air can be withdrawn from it. The substance from which the coloring matter is to be extracted is laid upon the partition, which is perforated, and a perforated cover is placed over it. Upon this the liquid intended to form the extract is poured, and as the air is extracted from the lower vessel by the pump, the pressure of the atmosphere forces the liquid through the substance and this extracts the coloring matter.

Aeschines, *es′ki neez* (389–314 B. C.), a celebrated Athenian orator, the rival and opponent of Demosthenes. He headed the Macedonian party in Greece, or those in favor of an alliance with Philip, while Demosthenes took the opposite side. Having failed in 330 B. C. in the prosecution against Ctesiphon for proposing to bestow a crown of gold upon Demosthenes for his services to the state, he withdrew from Athens. Latterly he established a school of eloquence at Rhodes.

Aeschylus, *es′ki lus*, (525?–456 B. C.), the earliest of the three great writers of Greek tragedy. He was of noble family, according to legend a descendant of Codrus, the last king of Athens. His father was probably connected with the worship of Ceres, and Aeschylus himself was early familiar with the Eleusinian Mysteries, strange religious rites into which he was afterward initiated. Aeschylus first won fame, not by poetry, but by bravery on the battlefield during the Persian wars. This military experience probably had an influence on his work in two ways; it turned his thoughts to patriotic studies and the glorification of his country, and it disposed the Athenians to regard his work favorably. For distinguished valor at Marathon (490), he, with his two brothers, received public honors.

The first success of Aeschylus in a dramatic competition was won in 485, and we are told that this was the first of thirteen such successes. In the latter part of his life he was defeated by Simonides in the contest for a prize offered for the best elegy on those who fell at Marathon. Aeschylus spent most of his latter years in Sicily and died there, according to an improbable legend, as the result of a blow upon the head from a tortoise which an eagle dropped. Of Aeschylus's seventy dramas but seven are preserved, in addition to a few fragments. These are *The Persians, The Suppliants, Prometheus Bound, The Seven against Thebes, Agamemnon, Choephori* and *Eumenides*. The three last named form a trilogy. The *Prometheus* is perhaps the best known to English readers through Mrs. Browning's poetical version. Aeschylus introduced a second actor, and was the first to provide appropriate scenery and costumes. In style, the tragedies of Aeschylus are grand and somber, as befits their themes.

Aesculapius, *es'ku la'pi us,* in classical mythology, the god of medicine, usually said to have been the son of Apollo. He was entrusted in his youth to the centaur Chiron, who taught him the art of healing. So skillful did he become that he was able to bring the dead to life, and for this, Jupiter, at the request of Pluto, who disliked to be robbed of his victims, killed Aesculapius with a thunderbolt. In art the god of medicine was usually represented as carrying a knotted staff, round which was entwined a serpent, the symbol of health.

Ae'sop, a famous Greek writer of fables, is said to have been a contemporary of Croesus and Solon, about the middle of the sixth century B. C. He visited the court of Croesus, and is also said to have visited Pisistratus at Athens. Finally he was sent by Croesus to Delphi to distribute a sum of money to each of the citizens. For some reason he refused to distribute the money, whereupon the Delphians, enraged, threw him from a precipice and killed him. Much of the account of Aesop is probably only legend and it is possible that such a man never existed. The fables called by his name were not written until long after he is supposed to have lived. In modern times several collections have been published. Among the most familiar of these fables are *The Fox and the Grapes, The Wolf and the Lamb, The Ass in the Lion's Skin, The Lion and the Mouse* and *The Ox and the Frog.*

Aesthet'ics. See ESTHETICS.

Aetna, *et'nah.* See ETNA.

Aeto'lia, an ancient division of Greece, situated on the north side of the Gulf of Corinth. Aetolia was originally settled by colonists from Epirus. By their exclusiveness these people estranged the other Greeks, so that even in the Golden Age they remained rude mountaineers and farmers. During the Macedonian wars the Aetolians became famous as soldiers of fortune and brought home great wealth. When the Gauls invaded Greece, the Aetolians took an active part in saving the country from the barbarians. Aetolia with Acarnania now forms a province of the kingdom of modern Greece.

Affida'vit, a document generally used when evidence is to be laid before a judge or a court, while evidence brought before a jury is delivered orally. The person making the affidavit signs his name at the bottom of it, and swears that the statements contained in it are true.

Affin'ity. See RELATIONSHIP.

Affinity, in chemistry, that force by means of which two or more substances unite to form a compound in which the properties of each substance are lost; as, oxygen and hydrogen unite to form water, and hydrogen and chlorine to form hydrochloric acid. We do not know the nature of this force, but it is present to a greater or less extent in all substances. In some elements, such as oxygen and chlorine, it is strong, and these unite to form a large number of compounds; in others, like nitrogen and argon, it is very weak, and these have but few compounds. Elements unite only in definite proportions, as atom for atom in the case of hydrogen and chlorine, or two atoms of one to one of the other, as in case of hydrogen and oxygen in forming water. Some elements unite in proportion of three atoms of one to two of another, and so on. The proportions are always the same for the same elements, but they may vary by multiples (See ATOMIC THEORY). The action resulting from chemical affinity usually produces more or less heat. Heat, also, may destroy this force and separate the compound into its elements, as, when steam is passed through a red-hot tube it is separated into oxygen and hydrogen.

Afghanistan, *af gan'is tahn',* a country in Asia. In part the boundaries are not well defined, but recently a joint Russian and British commission surveyed and marked by boundary stones the land from the Oxus to the Persian frontier. The area of Afghanistan is about 280,000 sq. mi.

The country consists largely of lofty, bare, uninhabited tablelands, sandy, barren plains, ranges of snow-covered mountains and deep ravines and valleys. Some of the valleys are well watered and fertile, but by far the larger part of the whole surface is rocky and unproductive. The climate is extremely cold in the higher, and intensely hot in the lower regions. Fruits of many varieties grow wild in the valleys, and the principal crops raised are wheat, barley, rice, maize, tobacco, sugar-cane and cotton. The chief towns are Kabul, Kandahar, Ghuzni and Herat. The people, most of whom are of the original Afghan race, are divided into a number of tribes, which are bold and warlike and are constantly engaged in dissensions among themselves. The Afghan language contains a great number of Persian words and is written with Arabic characters, but is distinct from the Persian. In religion the Afghans are Mohammedans of the Sunnite sect. See SUNNITES.

HISTORY. The history of Afghanistan from the time of Alexander the Great to the eighteenth century consists merely in a series of conquests made by different nations. In 1738 the country was conquered by the Persians and for a number of years a tolerably strong government was maintained. About 1825 Dost Mohammed succeeded in gaining a preponderating influence in the country, which, from the date of the exile of its ruler, Shah Shuja, had been in a state of anarchy. In 1839 the British army entered the country, occupied Kabul and replaced Shah Shuja on the throne; but two years later a widespread insurrection occurred among the Afghans; a number of British officers, women and children were murdered, and in the following year the British left Kabul. Soon, however, a fresh army came from India, retook Kabul and finished the war. Shah Shuja had been assassinated and Dost Mohammed again obtained the throne. He died in 1863 and left as his successor his son, Shere Ali, who for a time maintained friendly relations with the British. War was declared against him, however, in 1878; the British troops entered Afghanistan, the ameer fled to Turkestan and his son, Yakub Khan, who succeeded him, concluded a treaty with the British in 1879. The extension of the British frontier, the control by Britain of the foreign policy of Afghanistan and the residence of a British envoy in Kabul were the chief stipulations of the treaty. Encroachments by the Russians on territory claimed by Afghanistan almost brought about a rupture between Britain and Russia in 1885. The position of Afghanistan between the territory of Russia and that of Great Britain gives it its chief claim to political importance. Population, 1901, about 4,000,000.

Af'rica, the second largest grand division of the globe, lies in the eastern hemisphere, between latitude 37° 25′ north and 34° 50′ south, and longitude 51° 21′ east and 17° 30′ west. Its greatest extent from north to south is about 5000 miles, and its greatest breadth from east to west, a little less. The area of the continent, exclusive of islands, is 11,250,000 square miles, and including the islands, a little over 11,500,000 square miles. The coast line is 15,000 miles. The surrounding waters are the Mediterranean Sea and Strait of Gibraltar on the north, the Atlantic Ocean on the south, and the Indian Ocean, Gulf of Aden and Red Sea on the east. Aside from the Gulf of Guinea, which fills the great bend in the western coast, and the indentation which forms the Rea Sea on the northeast, there are no coast waters of special significance, the coast line being very regular. On the north are the two small gulfs of Gabes and Sidra, formerly known as the Great and Lesser Syrtes. Africa is joined to Asia by the Isthmus of Suez, and barely separated from Europe by the Strait of Gibraltar, which in its narrowest place is only eight and one-half miles wide. The important projections are capes Bon on the north, Verde on the west, Good Hope on the south and Guardafui on the east. The islands are few, and with the exception of Madagascar, the most important groups geographically connected with the continent are the Madeira, the Canaries and Cape Verde Islands. Single islands of some geographic and historic importance are Fernando Po, Saint Helena, Saint Thomas, Ascension, Saint Mary, Bourbon and Mauritius.

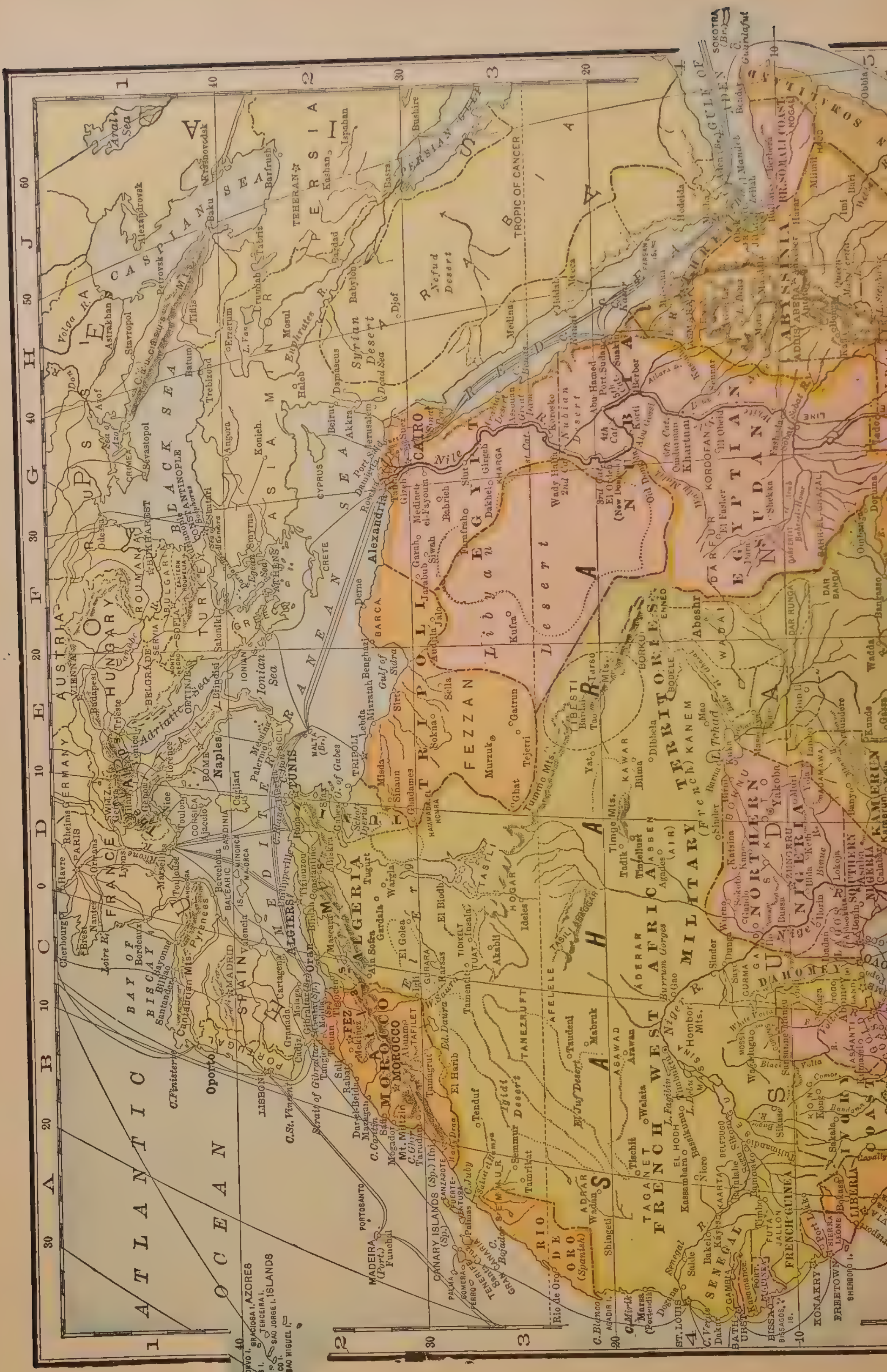
SURFACE AND DRAINAGE. In general, Africa consists of a plateau which rises abruptly from the ocean, with narrow lowlands at its base. Upon this plateau rise disconnected mountains and fragments of ranges. The great bend in the western coast naturally divides the surface into two sections, the northern, which is approximately elliptical in form, and the southern, which is roughly triangular. The northern division is considerably lower than the southern, but it contains an important mountain range, the Atlas, running parallel to the southern coast of the Mediterranean and attaining its greatest height in the western half, where some of the peaks exceed 14,000 feet. Toward the east it descends rapidly and is followed by some depressions that are below the sea level. On the south the Atlas range slopes directly to the plateau which forms the Sahara. This region has an irregular surface containing small plateaus of different degrees of elevation separated by *wadys*, or the valleys of dried-up streams. Running across these plateaus are ranges of hills and low mountains, which extend in various directions. (See SAHARA.) South of the Sahara is the Sudan, which extends to the Gulf of Guinea. This is a still lower region and has a surface consisting of plains and valleys interspersed with hills. To the southwest of the Sudan are the Kameroon Mountains, a low range which forms the highlands at the head of the Gulf of Guinea.

Extending southward from the vicinity of the Red Sea is the most important ridge of highlands. This attains its greatest elevation in the vicinity of mounts Kenia and Kilimanjaro, which are the most lofty peaks on the continent, the former having an elevation of over 18,000 feet and the latter of 19,750 feet. In the equatorial regions this highland is broken up into a number of parallel ridges, and between these are found the basins which contain the great lakes, Victoria Nyanza, Albert Nyanza and Tanganyika. Proceeding southward from Kilimanjaro, this highland takes the form of a mountain range and is known as the Drakenberg Mountains, which attain an altitude of 10,000 feet and extend to the southern extremity of the continent. On the western side of the southern plateau the highlands are lower, but the average altitude of this portion of the continent is about 4000 feet, while that of the northern section is but a little over 2000 feet.

The relief of the continent exerts an important influence over its drainage. Of the four great river systems all but one, the Zambezi, flow into the Atlantic or its tributary waters. Of these, the Nile and the Kongo have their head waters in or near the equatorial regions. Where the streams flow over the edge of the plateau they contain falls which obstruct navigation. The celebrated cataracts of the Nile, the rapids in the Kongo at Leopoldville. and Victoria Falls, on the Zambezi, are among the best illustrations of these cataracts, which are described in the articles upon their respective rivers. In the western portion of the northern projection of the continent the Senegal and Niger are the most important streams. The latter has its source quite near the coast and makes a remarkable bend before discharging its waters into the gulf. The southern portion of the continent is drained by the Orange and its tributaries flowing into the Atlantic, and the Limpopo into the Indian Ocean. To the north of the Zambezi are the Rovuma, Tana, Juba and Shebli, all comparatively unimportant streams.

Aside from North America, Africa contains the largest fresh-water lakes. Leading these is the Victoria Nyanza, approximately circular in form and having a diameter of about 180 miles. Next to Lake Superior it is the largest body of fresh water on the globe. The other lakes found in this portion of the continent are Albert Nyanza, Albert Edward, Tanganyika and Nyassa. Directly west of Nyassa is Lake Bangweolo, in which the Kongo has its source. Lake Chad, in the center of the Sudan, is an important inland lake with no outlet. Salt lakes are comparatively few and small.

MINERAL RESOURCES. But little is yet known of the geology of Africa, but so far as it has been studied, the indications are that the continent has been subject to fewer convulsions than those to the north, and the formations seem to be more regular than in Europe, Asia or America. Among the rocks are found many excellent building stones. The granite and syenite of the Nile basin have been known to the civilized world since the days of the Pharaohs. Extensive deposits of granite are also found along the Orange River, and deposits of sandstone and other stones are found to the north of the Orange River and in other localities. Iron and copper are also distributed over the continent. The Kongo basin contains valuable deposits of these ores, and some of the native tribes have attained considerable skill in fashioning the iron into agricultural implements and weapons, but none of the mines has been in the least developed. Coal has been found in paying quantities near the Zambezi River and is known to exist in some other sections, but no systematic survey has yet been made to determine the extent and value of the deposits. The most valuable mineral region as far as known consists of the diamond and gold regions in South Africa, the former near Kimberley in the northern part of Cape Colony, and the latter in Transvaal Colony. The diamond mines at Kimberley were opened in 1868, and since that time more than $400,000,000 worth of diamonds in the rough have been taken from them. They produce about 98 per cent of the world's output of this precious stone. The gold mines near Johannesburg were opened in 1883, and their value increased rapidly until at the breaking out of the Boer War in 1897 it was $55,000,000 a year. During that conflict operations practically ceased, but since then the mines have been rapidly developed, and their yearly output is now about $152,000,000. See DIAMONDS; KIMBERLEY.


ATLANTIC OCEAN
BAY OF BISCAY
FRANCE
PARIS
SPAIN
MADRID
LISBON
PORTUGAL
AUSTRIA HUNGARY
VIENNA
GERMANY
ITALY
ROME
Naples
TURKEY
CONSTANTINOPLE
BLACK SEA
CASPIAN SEA
Aral Sea
RUSSIA
ASIA MINOR
PERSIA
TEHERAN
ARABIA
PERSIAN GULF
MEDITERRANEAN SEA
Ionian Sea
Adriatic Sea
CRETE
CYPRUS
MOROCCO
FEZ
ALGERIA
ALGIERS
TUNIS
TRIPOLI
EGYPT
CAIRO
Alexandria
Nile R.
Libyan Desert
SAHARA
FEZZAN
FRENCH WEST AFRICA
MILITARY TERRITORIES
EGYPTIAN SUDAN
KORDOFAN
DARFUR
Khartum
ABYSSINIA
ADDIS ABEBA
Red Sea
GULF OF ADEN
SOKOTRA (Br.)
NORTHERN NIGERIA
SOUTHERN NIGERIA
KAMERUN
DAHOMEY
IVORY COAST
LIBERIA
SIERRA LEONE
FRENCH GUINEA
SENEGAL
GAMBIA
RIO DE ORO (Spanish)
CANARY ISLANDS (Sp.)
MADEIRA (Port.)
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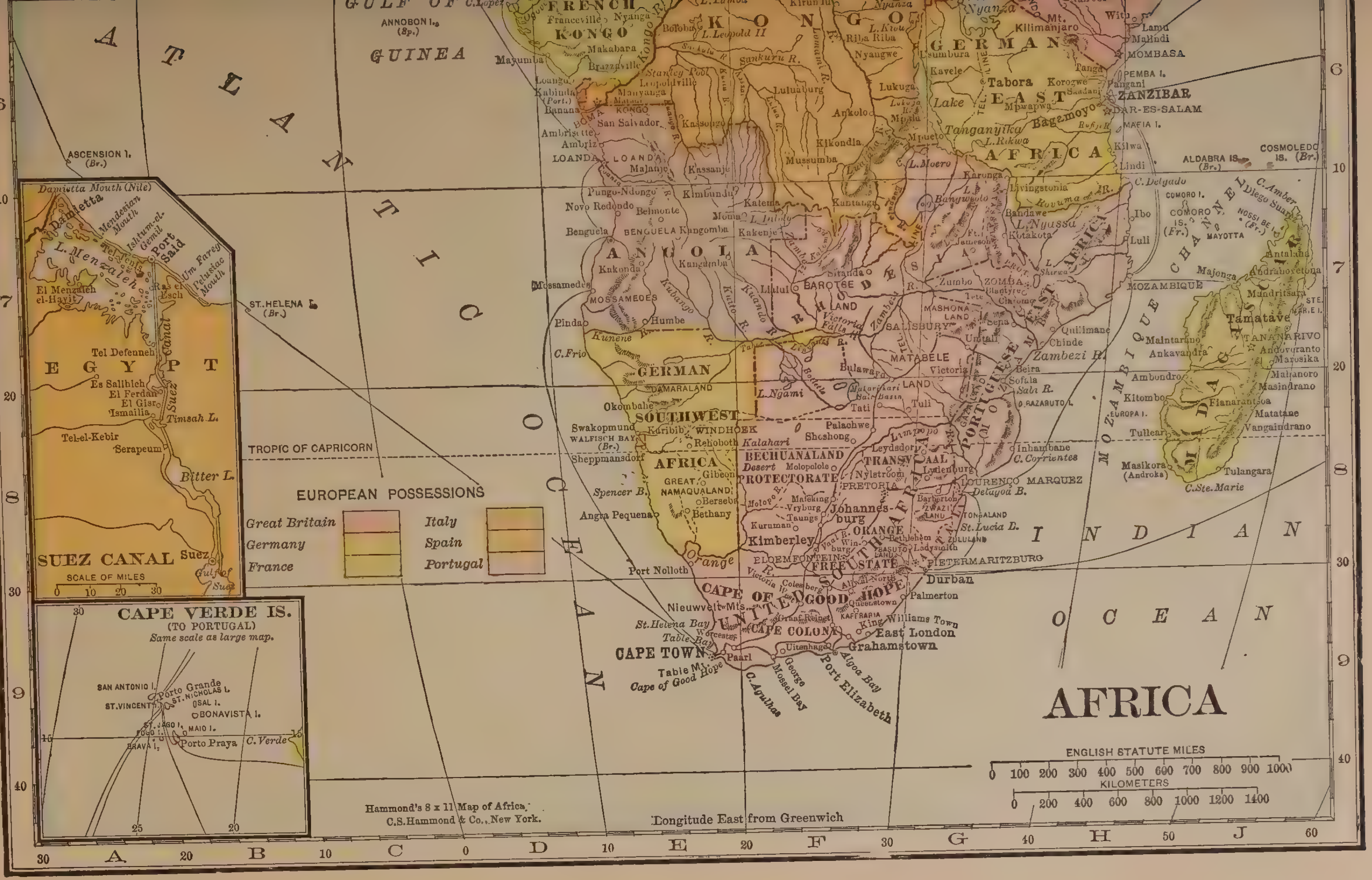
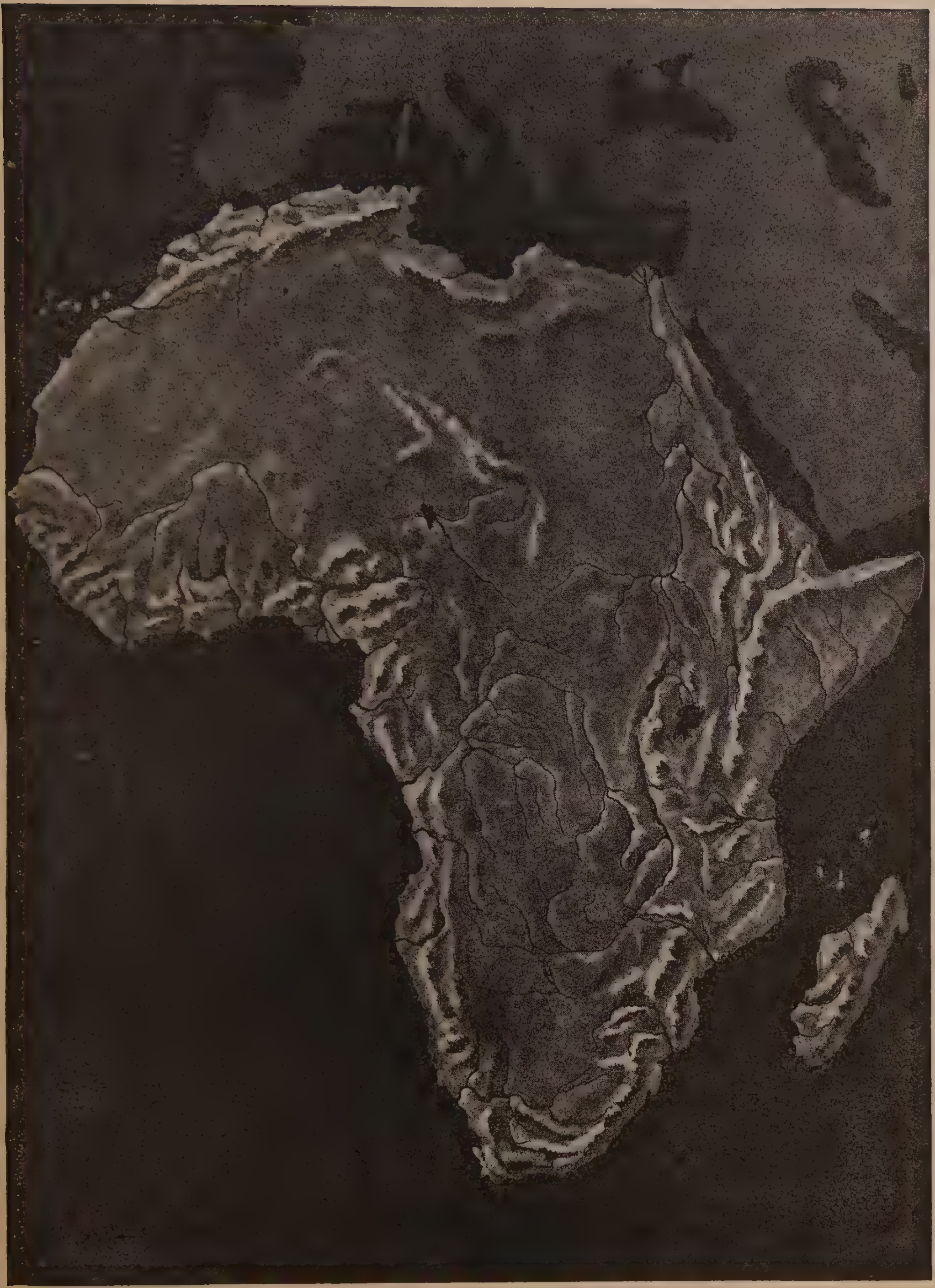


Hammond's 8 x 11 Map of Africa.
C.S.Hammond & Co., New York.



RELIEF MAP OF AFRICA

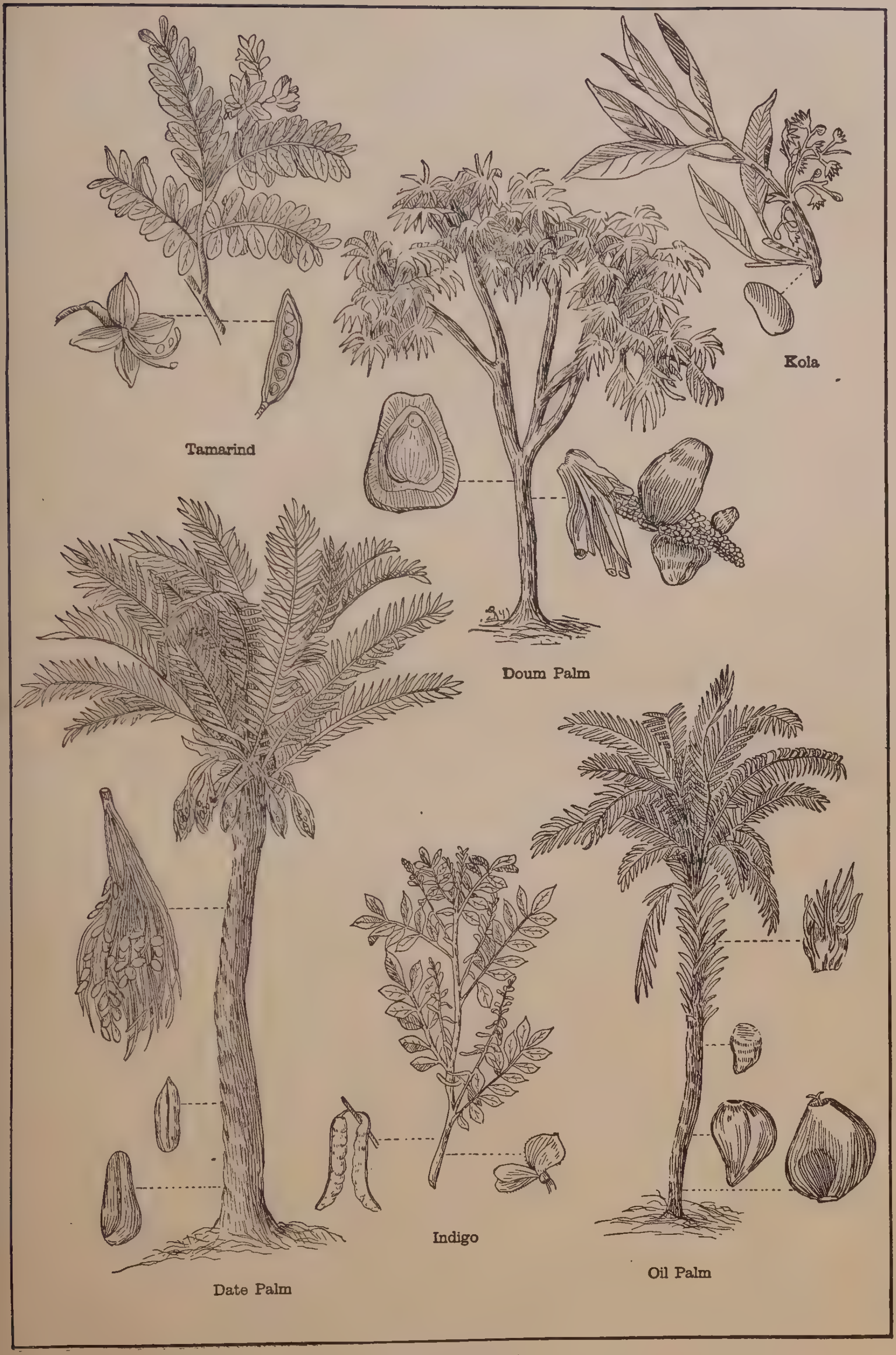
CLIMATE. The climate of Africa is more uniform than that of any other continent. This is due largely to the fact that the equator crosses it almost midway between the northern and southern extremities; therefore, the temperature gradually diminishes from the central portion of the continent toward the north and the south. The climate can be divided into tropical and warm temperate. The tropical region extends on the north almost to the northern boundary of the Sahara, and because of altitude and other local conditions the region of greatest heat is found between the tenth and twentieth parallels of north latitude. To the north of the Sahara and in the region of the Atlas Mountains the climate very closely resembles that of southern Europe, but in the Sahara there is a marked difference between summer and winter. During the winter this is an area of high pressure and the wind blows outward, while during the summer the intense heat of the sun causes sea breezes, but because of the hot surface over which these blow, they are dry winds, and the region seldom has any rain.

The altitude of the southern part of the continent gives it a cooler climate in corresponding latitudes than is found in the northern. Even in the equatorial regions the interior is healthful, and Europeans can reside there without difficulty, while in the same latitude, with scarcely any exception, the low regions along the coast prove fatal to white men. South Africa has a temperate climate corresponding quite closely to that found in the states of Virginia, Kentucky and Tennessee.

The distribution of rainfall is very unequal. In the equatorial regions, especially along the course of the Kongo, the precipitation is very heavy. Here there are two rainy seasons in the year, caused by the vertical position of the sun, but as we go north or south from this region the rainfall diminishes, and in the temperate regions there is practically only one rainy season each year; over portions of the Sahara no rain ever falls, and over the rest of it, very little. The arid region south of the Zambezi, forming the so-called Desert of Kalahari, is not totally devoid of rain and has enough moisture to make it a profitable grazing country. To the south of this the rainfall is frequent throughout the year. and agriculture can be successfully followed.

VEGETATION. The vegetation is very closely related to the rainfall. In the northern portion of the continent the oak and olive are found, as are the semi-tropical fruits, grains and vegetables common to the countries of southern Europe. The inhabitants of Algiers, Morocco and other states bordering upon the Mediterranean derive considerable income by exporting these products to Europe. As we go southward from this region the vegetation becomes very scarce until at the Sahara it ceases altogether, except in the isolated cases where springs are found, but as we near the northern coast of the Gulf of Guinea, the desert yields to the savanna region which characterizes most of the Sudan. This is composed of open country covered with herbage and interspersed with groups of forest. From the Gambia River to the coast, and extending southward to within a short distance of the mouth of the Kongo and thence eastward almost to Lake Victoria Nyanza, there is an area of tropical forest which, for extent, size, variety of trees and density of vegetation, is equaled only by the forests of the Amazon. The region covered by this forest is more than half as large as the United States, and over most of this the vegetation is so dense that the sun seldom penetrates to the ground. A few other forest regions are found. These are in Abyssinia, around the sources of the Kongo, in British Central Africa and along the coast of German East Africa. With these exceptions, south of the great forest area the savanna belt extends across the continent until the Zambezi River is reached. From this, the southwestern portion almost to the Cape of Good Hope is arid, and a narrow strip along the western coast is almost a desert. This region follows the coast northward as far as the tenth parallel of south latitude. The corresponding portions of the east coast contain forests and open country and are sufficiently well watered to admit of successful agriculture. The trees in these regions, as well as other forms of vegetation, are peculiar to the locality, a fact undoubtedly due to the distance of this portion of the continent from other land masses. The interior of the plateau contains extensive areas which are valuable for grazing and other agricultural purposes. Many varieties of palm are found in the warm temperate regions on both sides of the equatorial belt.

ANIMAL LIFE. Africa is the home of the largest members of the animal kingdom, and owing to the absence of great central mountain barriers they may be found in all regions without special modification of type. Among the carnivorous animals are the lion, the panther, hyena, leopard, fox and jackal. The leading



PLANTS OF AFRICA

herbivorous animals are the elephant, rhinoceros, buffalo, giraffe and hippopotamus. Several species of antelopes are also found. The monkey family is spread over the whole continent, represented by numerous types such as the Barbary ape, the dog-faced baboon, the Gallago lemur and the anthropoid chimpanzee and gorilla. Animals resembling the horse are the zebra, quagga, the pigmy Mauritanian ass and the camel. Of the mammals there are about 500 species peculiar to this continent, of which about 50 are of the antelope family. Among the birds found in Africa are the ostrich, secretary, ibis, guinea fowl, weaver bird, roller bird, love bird, wax bill, sun bird, parrot, quail and others. The reptiles include the huge python, the crocodile and many poisonous snakes; while among the insects are termites, locusts, the destructive Tsetse fly and many butterflies of brilliant hues.

INHABITANTS. Africa is peopled by four races, the Semitic and Hamitic races in the north, and the negro and Hottentot races in the central and southern portions. From time immemorial northern Africa has been the home of the white race, and equatorial and southern Africa the home of the colored race; but these have gradually intermingled so that the Sudan is peopled by a mixed race. Frequent conquests by the Mediterranean countries have also caused so many changes in the population that race distinctions are now difficult to trace. The equatorial regions are peopled by the negro race belonging to the branch generally known as the Bantus. This branch is very extensive and includes all of the tribes from the region south of the Sudan to the country of the Hottentots, almost in the extreme southeastern portion of the continent. The various tribes inhabiting this vast section differ from one another in size, color and features; yet they all speak kindred languages and possess numerous other points of resemblance, sufficient to classify them as belonging to the Bantu branch. A rare exception to these tribes is found in the dwarfs dwelling in the dense forests along the Aruwimi.

The Hottentots, inhabiting the southeastern portion of the continent, are undoubtedly a branch of the negro race, but they differ from the Bantus in color, in general features and in language. The most important nations inhabiting this part of the continent are the Kaffirs, Bushmen and Hottentots. These have now all been brought under the control of the British government. See NEGRO RACE, *color plate.*

The best authorities estimate the population of Africa at about 175,000,000, but the number of people in the interior is not definitely known. There are now about 1,125,000 Europeans on the continent, and this number is increasing each year, the chief immigrations being to British South Africa.

POLITICAL DIVISIONS. Since 1875 the political map of Africa has been almost entirely changed. The modifications have been due to the rapid progress of explorations, to conflicts with some of the native tribes and to the predominating influence which some of the great powers of Europe exercise. As a result of these influences, the entire continent, with the exception of Abyssinia, Morocco and Liberia, is now directly or indirectly under control of one of the European governments. The principal political divisions are as follows:

Independent states: Abyssinia, Morocco and Liberia.

Quasi-independent states: Egypt and British Sudan. While Egypt and the Sudan maintain governments nominally subject to Turkey, they are practically under British rule, and the Kongo Free State is under the jurisdiction of the king of Belgium. There are also many petty kingdoms in the colonial possessions of European powers.

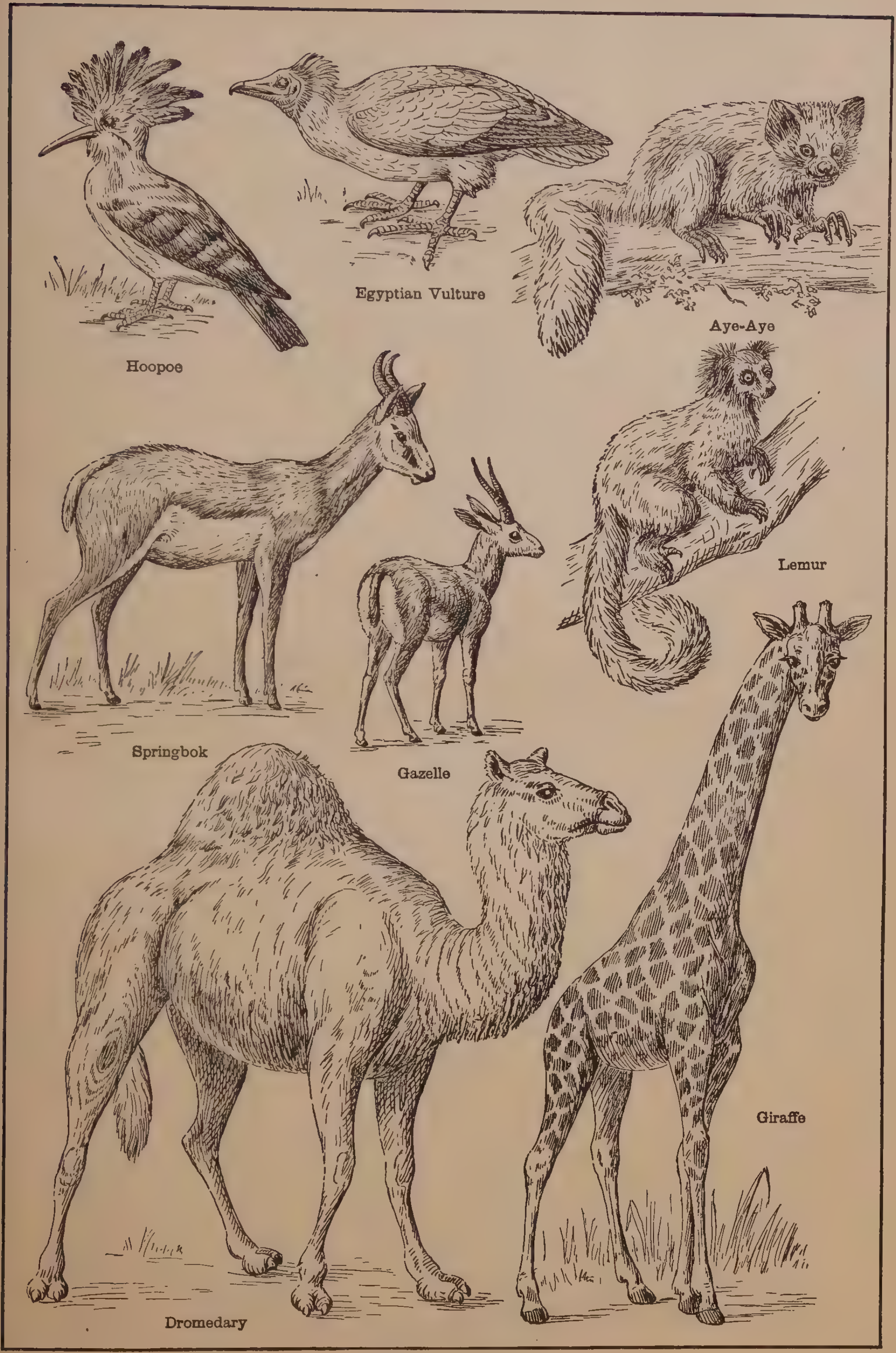
Belgian colony: Kongo State.

British colonies: Basutoland, Bechuanaland Protectorate, British Central Africa Protectorate, British East Africa, Cape Colony, Gambia, Gold Coast, Lagos, Mashonaland, Matebeleland, Natal, Niger Coast Protectorate, Nigeria, Orange River Colony, Rhodesia, Sierra Leona, Somali Coast Protectorate, Transvaal Colony, Uganda, Walfish Bay, Zanzibar, Zululand. Area, 3,031,084 square miles; total population, 42,647,761. The Niger territories are governed by the Royal Niger Company, under a charter issued in July, 1886.

French colonies: Algeria, Algerian Sahara, Dahomey, French Kongo, French Guinea, French Sudan, Ivory Coast, Sahara, Senegal, Somali Coast and Obock, Tunis, Wadai. Total area, 3,260,814 square miles; total population, 31,682,000.

German colonies: Kameroon, German East Africa, German Southwest Africa, Togoland. Total area, 930,760 square miles; total population, 14,200,000.

Portuguese colonies: Angola, Portuguese East Africa, Portuguese Guinea. Total area, 790,240 square miles; total population, 8,059,000.



ANIMALS OF AFRICA

Italian colonies: Eritrea, Somaliland. Total area, 188,500 square miles; total population, 950,000.

Spanish colonies: Rio d'Oro, Spanish Kongo. Total area, 244,000 square miles; total population, 107,000.

Turkish colonies: The Turkish colonies not mentioned above are Tripoli, including Benghazi. Area, 398,000 square miles; population, 1,300,000.

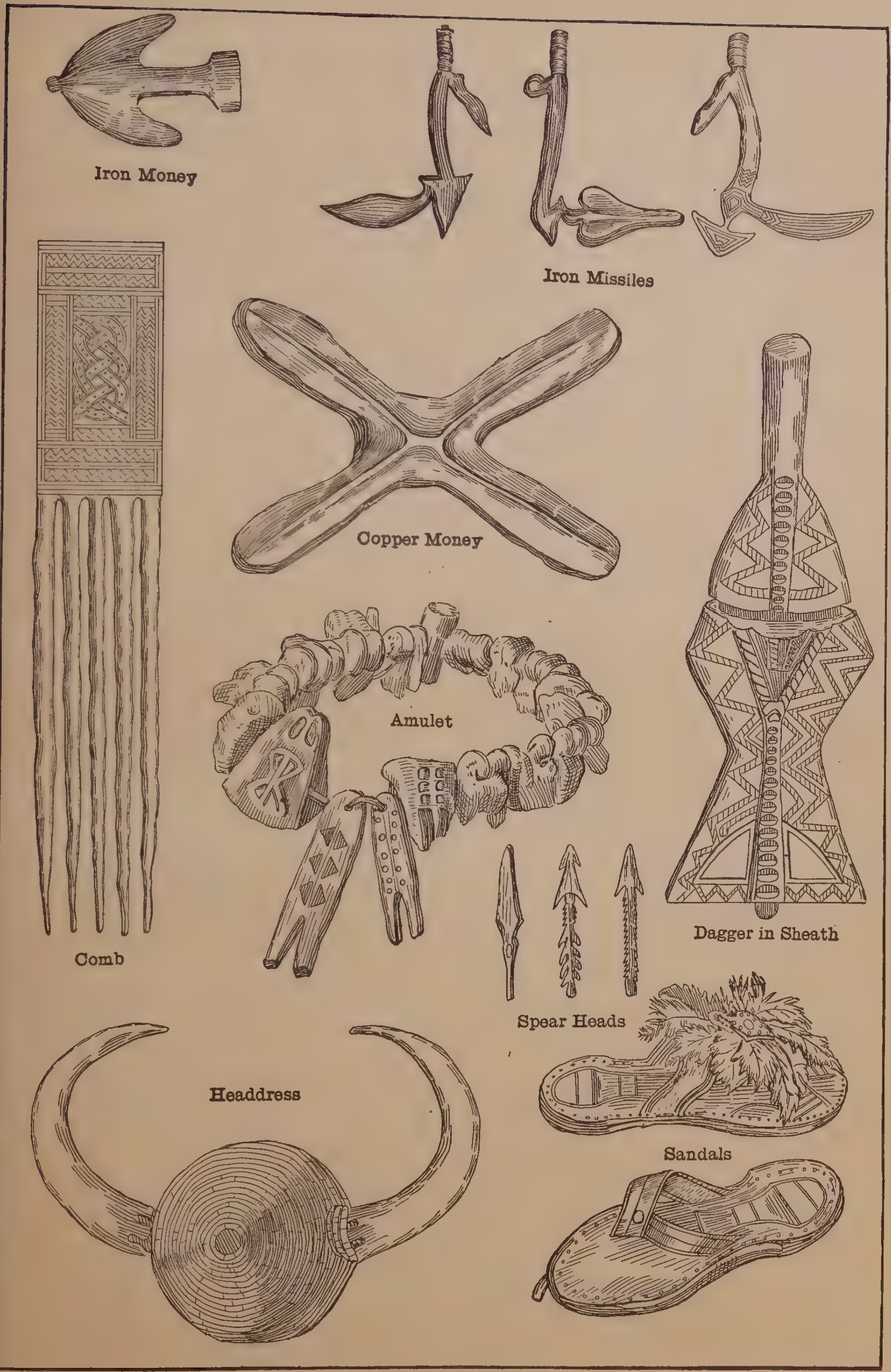
HISTORY. Africa is the home of the oldest civilization. Egypt was an ancient nation before the Roman Empire was founded, and extending along the coast of the Mediterranean were various nations from Egypt to Carthage, which, previous to and during a portion of the existence of the Roman Empire, held considerable influence. Undoubtedly the power of these nations prevented the exploration of the continent to the south; hence the Nile valley and a narrow strip along the northern coast were the only portions of the continent that were known to the world for many centuries. During the Middle Ages the influx of Arabs was attended by some exploration of the regions around the upper portions of the Nile and the eastern part of the Sudan, and in the fifteenth century several voyages of discovery were made along the western coast. Finally, in 1485 Bartholomew Diaz, sailing under the auspices of King John of Portugal, discovered and sailed around the Cape of Good Hope. Twelve years later Da Gama, following the same course, sailed around the cape and reached India. But these voyages did not awaken any general interest, though in the latter half of the sixteenth century the Portuguese established colonies on both the eastern and western coasts, where they still hold possessions.

The event which led up to the present interest in Africa was the exploration of the interior by Mungo Park, who made an extended expedition through the Niger country from 1795 to 1797. However, it was a number of years after this before his efforts were seconded by others. In 1840 David Livingstone began his great work of exploration and philanthropy in southern Africa, working northward from Cape Town. Between this date and the time of his death in 1873, Doctor Livingstone explored nearly all of that portion of the continent as far north as the head of Lake Tanganyika (See LIVINGSTONE, DAVID). On his death the proprietors of the New York *Herald* and London *Telegraph* combined to send Henry M. Stanley, who had previously visited Livingstone on Lake Tanganyika, to complete the work which the great explorer left unfinished. On this expedition Mr. Stanley explored the country around the headwaters of the Nile, then traveled from Lake Victoria Nyanza southward as far as Lake Bangweolo, thence followed the Lower Lualaba until he reached the Atlantic coast, settling the problem as to the extent and direction of the Kongo, by proving that this river and the Lualaba were one.

Partitioning of Africa. In 1876 the African International Association was organized, with Leopold II, king of the Belgians, as president. The purpose of this association was to explore systematically the equatorial portion of Africa, beginning upon the eastern coast and working westward. Mr. Stanley, having accomplished this feat, was immediately engaged by the association to return to Africa and open up to settlement a large tract of country on the Kongo. Mr. Stanley's efforts resulted in the establishing of the Kongo Free State (See STANLEY, HENRY M., and KONGO FREE STATE). The interest which this movement aroused among the nations of Europe led to the convening of the Berlin Congress in 1885, at which all of the leading nations of Europe and the United States were represented. The purpose of this congress was to arrive at a mutual agreement by which, without conflict, the different nations could extend their influence over the portions of Africa still unoccupied or unclaimed by civilized powers. As a result of their deliberations, the continent was divided among them as now shown on the political map. See *Political Divisions*, above.

Under the influence of Great Britain, France and Germany, improvements have been rapidly introduced into the regions under their respective control. The greatest of these enterprises are the Cape-to-Cairo Telegraph and the Cape-to-Cairo Railway; the latter is described under its appropriate title.

South African Union. The aggressive attitude of the English settlers led to the Boer War, which lasted from October, 1899, to March, 1902, and resulted in depriving the Orange Free State and the Transvaal Republic of their independence and making them British colonies. Since the war the tendency of the English colonies towards a closer union resulted in the formation of a new Federation, which took the name *The United States of South Africa.* The Federation includes Cape Colony, Transvaal, Orange River Colony and Natal. These colonies have a combined area of 660,000 square miles, and a population of about 5,000,000, one-fifth



NATIVE AFRICAN HANDIWORK

of which are white. The general provisions of the constitution are similar to those of Canada, except that the colonies are not given as much power in local legislation. English and Dutch are the official languages. There are two capitals; the legislative capital is located at Cape Town and the executive is at Pretoria. Right to vote is restricted exclusively to the white population.

See articles on the different political divisions and rivers. There have been many books written upon Africa. Among the most accessible of these are Stanley's *Through the Dark Continent, The Congo and the Founding of Its Free State,* and *Darkest Africa;* Livingstone's *Missionary Travels and Researches in South Africa;* Bacon's *The White Man's Africa* and Roosevelt's *African Game Trails.*

African Methodist Episcopal Church, a branch of the Methodist Episcopal Church, organized in Philadelphia under Richard Allen in 1816, exclusively for the benefit of the colored people. Four years later the African Methodist Episcopal Zion Church was organized. Each of these organizations, while independent of the mother church, is conducted under the same rules and polity as the church from which it sprang. The African Methodist Episcopal Church had in 1906, 858,323 members, and the Zion Church had 583,106. See METHODIST EPISCOPAL CHURCH.

Af′rikan′der, the Dutch term often applied to white persons born in South Africa. See BOERS.

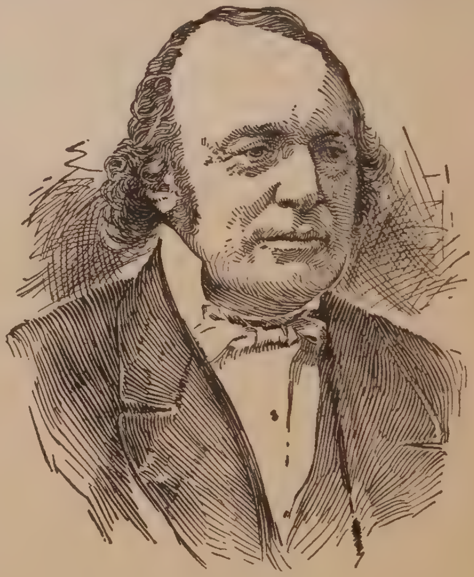
Agamem′non, in Greek mythology, king of Mycenae and Argos, brother of Menelaus, and commander of the allied Greeks at the siege of Troy. Returning home after the fall of Troy, he was treacherously assassinated by his wife, Clytemnestra, and her lover, Aegisthus. He was the father of Orestes, Iphigenia and Electra.

Aganip′pe, a fountain on Mount Helicon, in Greece, sacred to the Muses, which had the property of inspiring with poetic fire whoever drank of its waters.

Ag′aric, a fungus, of which over a thousand species are known. They are arranged in five sections, according as the color of their spores is white, pink, brown, purple or black. Many of the species are edible, like the common mushroom which grows in fields and pastures. See MUSHROOMS.

Aga′sias, a Greek sculptor of Ephesus, who flourished about 400 B. C., and whose celebrated statue, known as the Borghese Gladiator, representing a soldier contending with a horseman, is now in the Louvre, Paris.

Agassiz, ALEXANDER (1835–), an American naturalist and philanthropist, son of Louis Agassiz, was born in Neuchâtel, Switzerland. He came to the United States in 1849, and graduated at Harvard in 1855. He was on the California Coast Survey and was with his father in the museum of zoology at Cambridge, Mass. He was later superintendent of the Calumet and Hecla copper mines, Lake Superior, and amassed a great fortune, of which he gave liberally to Harvard. After visiting different museums in Europe he was made curator of the museum in Cambridge, which was founded by his father. Professor Agassiz was elected a member of the National Academy of Sciences and other scientific societies in this country and Europe, and was soon recognized as one of the great authorities on marine zoology.



LOUIS AGASSIZ

Agassiz, LOUIS JOHN RUDOLPH (1807–1873), an eminent naturalist, son of a Swiss Protestant clergyman. He completed his education at Lausanne, and early developed a love of the natural sciences. He studied medicine at Zürich, Heidelberg and Munich. His attention was first specially directed to the study of fishes by being called on to describe the Brazilian fishes. As professor of natural history at Neuchâtel he distinguished himself by his discoveries concerning fossil fishes. His researches led him to propose a new classification of fishes, which he divided into four classes, distinguished by the characters of the skin. His system has not been generally adopted, but the names of his classes have been used. In 1836 he began the study of glaciers. In 1838 he was induced to settle in America, where he was connected as a teacher first with Harvard University, Cambridge, and later with both Cornell University and Harvard. He engaged in various investigations and explorations and published numerous works. In 1865 he made zoological excursions and investigations in Brazil, which were productive of most valuable results. Agassiz held views on many important points in science different from those which prevailed among the scientific men of the day, and in particular he opposed the theory of evolution. His most important writings are *Researches on Fossil Fishes*, *Glacial Systems*, *Outlines of Comparative Physiology* and *A Journey to Brazil*.

Agassiz, Mount, an extinct volcano in Arizona, 10,000 feet in height. There is another peak of the same name in Utah which rises to a height of 13,000 feet.

Agassiz Association, an organization which was formed by Harlan H. Ballard in 1879 to promote nature study among young people. It was named in honor of Louis Agassiz, the great scientist. The organization has spread over a large part of the world and has as many as one thousand chapters and ten thousand members. There are many advantages connected with membership. A correspondence course of free instruction on scientific subjects and natural history is given, and prizes are offered for original research. The headquarters of the Association are at Pittsfield, Mass. The badge worn by the members is a Swiss cross and the official paper is *The American Boy*.

Ag′ate, a variety of quartz usually classified as chalcedony. Agates are variegated, the colors being arranged in parallel lines or so as to give the stone a moss-like appearance. They are extremely hard, but take a high polish, and are used for making choice marble and for ornaments. Agates are found in many localities, but most of the commercial supply comes from Uruguay and Brazil. They may vary in color from pure white to jet black, but shades of red are the most common.

Agath′ocles (361–289 B. C.), tyrant of Syracuse, was the son of a Sicilian potter. After working a while at his father's trade he became a leader of a robber band. He afterward became a soldier under Damas, attained importance, and on the death of Damas married his widow, thus acquiring immense wealth and laying the foundation of his political fortunes. He became autocrat of Syracuse in 317 B. C. He declared all debts canceled and confiscated the property of the rich and divided it among the poor.

Aga′ve, a genus of plants, popularly known as American aloes. They are generally large, and have a massive tuft of fleshy leaves with a spiny apex. They live for many years—ten to seventy, according to circumstances—before flowering. This long delay gives them the common name of century plant. When the time for flowering approaches, a tall stem springs from the center of the tuft of leaves and grows very rapidly until it reaches a height of fifteen, twenty or even forty feet, and bears, toward the end, a large number of flowers. When the fruit has matured the stem dies to the ground. The best known species is the common American aloe, now extensively grown in the warmer parts of Europe and Asia. The sap, when fermented, yields a beverage resembling cider, called by the Mexicans *pulque*. The leaves are used as fodder; their fibers are formed into thread, cord and ropes; an extract from the leaves is used as a substitute for soap; slices of the withered flower-stem are used as razor-strops.

Age. In law, *age* is applied to the periods of life when men and women are enabled to do that which before, for want of years and consequently of judgment, they could not legally do. Full age in male or female is twenty-one years, which age is completed on the day preceding the anniversary of a person's birth.

The term is also used to designate the successive epochs or stages of civilization in history or mythology.

The *Archaeological Ages* or *Periods* are the Stone Age, the Bronze Age and the Iron Age, these names being given in accordance with the materials chiefly employed for weapons and other implements during the particular period. See Bronze Age; Iron Age; Stone Age.

Agen, *a zhahN′*, a town of France, capital of the department of Lot-et-Garonne, on the Garonne River, 73 mi. s. e. of Bordeaux. Agen has an important trade with Toulouse and Bordeaux and manufactures cotton, serge, leather, wool and linen fabrics of fine quality. It is a quaint old town and was known amongst the Romans as Aginnum. It is the seat of a bishopric and has a cathedral which dates from the time of Clovis. Population in 1901, about 18,500.

A′gent, in law, a person employed to act for another, called the *principal,* the relation between them being called *agency.* With reference to the authority conferred upon him, an agent may be *general* or *special,* the latter having authority to act for his principal only in a special business. No particular form of appointment is required, except in a few special cases; for instance, an instrument under seal is necessary to confer authority to do an act in the name of the principal under seal. Such an instrument, and the authority conferred by it, is called *power of attorney.* The agent may bind his principal by acts within the scope of his authority. He is personally liable to third persons on contracts made as the agent, when he does not disclose the principal for whom he is acting, but not otherwise, unless he exceed his authority. Public agents are not usually themselves liable upon contracts made in their official capacity. The principal is generally liable to third persons for civil offenses committed by the agent when acting within the scope of his agency; but this does not relieve the agent of personal liability himself. As against the principal, an agent is entitled to compensation for his services and reimbursement for the expenses of his agency, and for personal loss or damage in properly transacting the business thereof. As a means of enforcing these rights, the law gives him a lien upon the property of the principal in his hands. See CONTRACT; LIEN.

Ages′ila′us (444–360 B. C.), a king of Sparta who acquired renown by his exploits against the Persians, Thebans and Athenians. Though a vigorous ruler and almost adored by his soldiers, he was of small stature and lame from his birth. Xenophon, Plutarch and Cornelius Nepos are among his biographers.

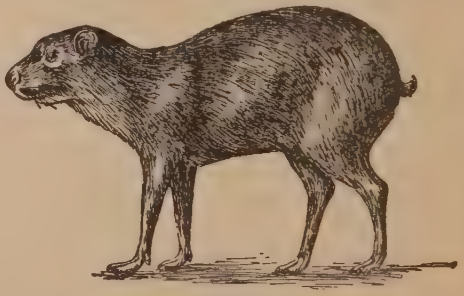
Agincourt or **Azincourt,** *ah zhaN koor′,* a village of northern France, in the department Pas de Calais, famous for the battle of 1415, in which Henry V of England, with a force of 15,000 men, overcame the French, who numbered about 60,000.

Ag′new, DANIEL HAYES (1818–1892), an American surgeon who was a specialist on diseases of the eye and of women. He was a profound anatomist, and had wonderful skill and ease in operating. Sympathetic and gentle, he was an ideal physician and consultant. He was emeritus professor of surgery, and honorary professor of clinical surgery at the University of Pennsylvania. He became widely known through his treatment of President Garfield's wound. Doctor Agnew wrote *Practical Anatomy* (1856) and *The Principles and Practices of Surgery* (1878–1883).

Agnosticism, *ag nos′ti sizm,* the doctrine that the existence of a personal God or an unseen world can not be proved or disproved. Those holding this doctrine also maintain that one can not prove his own existence. Agnosticism is founded on the inability of the human mind to arrive at absolute knowledge and belief and the failure of scientific investigation to discover the first causes for the phenomena of nature. An ancient form of agnosticism is found in the doctrine of a school of philosophers known as the Sophists.

Ag′nus De′i, a term applied to Christ in *John* I, 29, and in the Catholic liturgy a prayer beginning with the words "Agnus Dei," generally sung before the communion. The term is also commonly given to a medal, or more frequently a cake of wax, consecrated by the pope and stamped with the figure of a lamb supporting the banner of the cross. These medals are distributed to the faithful the first Sunday after Easter. In the Greek Church, Agnus Dei is a cloth bearing an image of a lamb. It is used to cover the cup in the communion service.

Agouti, *a goo′te,* the name of several rodents, forming a family by themselves. There are eight or nine species, all belonging to South America and the West Indies. The common agouti, or yellow-rumped cavy, is of the size of a rabbit. It burrows in the ground or in hollow trees, and lives on vegetables,. It grunts like a pig, and is as greedy, so that where it is common it does much injury to crops. The agouti's flesh is white and palatable.



AGOUTI

Agra, *ah′gra,* a city of India, capital of a province of the same name, 841 mi. n. w. of Calcutta and 110 mi. s. e. of Delhi. It has interesting structures, among which are the imperial palace, the Moti Masjid, or Pearl Mosque; the mosque called the Jama Masjid, or Great Mosque. and the Taj Mahal, a mausoleum of the seventeenth century, built by the emperor Shah Jehan to his favorite queen (See TAJ MAHAL). Agra has a trade in grain, sugar, tobacco and cotton, and manufactures, including inlaid mosaics, for which the inhabitants have acquired a world-wide reputation. The city is one of the oldest in India and has been prominent since the first part of the sixteenth century. During the Sepoy mutiny of 1857 it was a place of refuge for Europeans, after it was captured by the British. At present Agra is an important railway center and also a commercial and financial center of northwest India. Population in 1901, 188,300.

Agram, *ah'gram*, a city in the Austrian Empire, capital of Croatia and Slavonia. 160 mi. s. s. w. of Vienna. It contains the government buildings, cathedral, university, theater and other beautiful buildings. Agram carries on an active trade, and manufactures carpets, silk, tobacco, leather and linens. Population in 1901, 57,689.

Agra'rian Laws, laws enacted in ancient Rome for the division of the public lands. The right to the use of the public land belonged originally only to the ruling class; but latterly the claims of the plebeians to it were also admitted, though they were often unfairly treated in the sharing of it. Hence arose much discontent among the plebeians, and various remedial laws were passed, none of which, however, was ever put into execution.

Agric'ola, GNAEUS JULIUS (37–93), a Roman statesman and general. As governor of Britain he reduced the greater part of the island to subjection, and although he was the twelfth Roman general who had been in Britain he was the first who in any degree reconciled the Britons to the Roman yoke. He constructed the chain of forts between the Forth and the Clyde, and sailed round the island, discovering the Orkneys. His life, written by Tacitus, his son-in-law, gives a most valuable account of Britain during the early Roman rule.

Agricola, RUDOLPHUS (1443–1485), an eminent educator of the Middle Ages, born at Baflo, Holland. On completing his education he returned to his native country and gained reputation through his introduction of the study of Greek into the countries north of the Alps. Later he delivered lectures at Heidelberg and Worms. His most important work in education relates to methods of study and instruction, in which he advocated certain radical reforms. He established three principles essential to the pursuit of any study: (1) understand what has been learned; (2) retain what is understood; (3) derive advantage from what has been learned.

Ag'ricul'tural College, a college established for the purpose of higher education in agriculture. The first suggestion of an agricultural college was made by Washington in his first message to Congress in 1790, but it was many years before this suggestion bore fruit. The first agricultural college in England was established in 1845, and the first one in the United States was founded in connection with the University of Michigan in 1857. In 1862, by the passage of what is known as the Morrill Act (See MORRILL, JUSTIN S.), large tracts of government land were granted the different states, for the purpose of maintaining agricultural colleges, and in 1890 each college was granted fifteen thousand dollars a year additional, with provision that this grant should be increased by a thousand dollars a year until it reached $25,000. Every state now maintains an agricultural college, and most of them are in connection with state universities. The courses of study include chemistry, with special reference to its application to agriculture, physics, geology, botany, animal physiology and kindred subjects. In addition to these studies, there is much experimental work in laboratories and practice work on the farm connected with the college. The courses vary considerably in different states, some colleges emphasizing one branch and some another. This variation is due largely to local influences, as the college of each state attempts to make its work of such a nature as to adapt it to the most important interests of the locality. See AGRICULTURAL EXPERIMENT STATIONS; AGRICULTURE, subhead *Agricultural Education;* AGRICULTURE, DEPARTMENT OF.

Agricultural Experiment Stations, stations for carrying on scientific experiments in the interests of agriculture, horticulture and dairying. The first agricultural experiment station in the United States was established at Wesleyan University, Middletown, Conn., in 1875. In 1887 Congress made an appropriation of $15,000 a year to each state and territory for the purpose of maintaining stations of this sort, and there are now stations in every state and territory, including Alaska, Hawaii, Guam and Porto Rico. They are usually connected with agricultural colleges. The work of these stations is to experiment with fertilizers and soils; to improve varieties of grain and fruit and breeds of live stock; to study the habits of, and to devise means for destroying, noxious insects, and to study the diseases of domestic animals and provide means for their prevention and cure. Each station emphasizes the line of work that is of greatest importance to the agricultural interests of the state in which it is located. The results of their experiments are made known through bulletins, which are distributed free to the farmers of the state in which the station is located. There are now over 700 agricultural experiment stations in the world. They have been the chief means of introducing scientific methods into agriculture. See AGRICULTURE; AGRICULTURAL COLLEGE.

Agriculture, the art of cultivating the ground for the purpose of raising grain and othei crops for man and domestic animals. Agriculture is the oldest of occupations and the basis of all other arts. It began with the dawn of civilization and, with occasional interruptions, has continued to make progress to the present time. The Egyptians, Babylonians, Assyrians and Chinese are the oldest civilized nations who practiced agriculture systematically. Many references to Egypt as a grain or corn country are found in the Old Testament, and in the earliest records of the other ancient nations we find references to their agriculture.. The Greeks carried on agriculture to a limited extent, but with systematic methods and good results, though their country was not well suited to this line of industry. The Romans attained great perfection in the art and became the foremost of the ancient nations. Several of their writers produced works on agriculture, which show that they were familiar with and practiced the best principles and methods in vogue at the present time. The Romans were familiar with the use of fertilizers, the rotation of crops, methods of breeding domestic animals and irrigation. Wherever they went they took their knowledge and methods of agriculture, and as a result of their conquests this art received great advancement in Britain and a number of other countries of Europe and western Asia.

During the Middle Ages agriculture declined. Nearly all of the land in Europe was owned by the nobility, who spent their time in war and the chase, and left the tilling of the soil to serfs and vassals. As a result agriculture became almost a lost art and it was not until the sixteenth century that it again received attention. During this century the foundations of the present methods were laid in England and other European countries, and from that time to the present its progress has been regular and systematic. The leading agricultural countries of Europe are England, France and Germany.

THE UNITED STATES. *Early Progress.* The early English settlers brought with them the methods of agriculture practiced in the mother country and tried to adapt these to their new surroundings. Their implements were crude, their seed scarce and often of inferior quality, and in New England the soil was stubborn and the climate unfavorable. Under these conditions it is not surprising that the early colonists made but little progress, and that with the exception of tobacco and cotton in the South only sufficient crops were raised to supply the needs of the family or a very limited local market. This condition continued until after the Revolutionary War, and the farmers became so wedded to their old methods that changes for the better were received with but little favor.

The opening to settlement of the vast territory in the Mississippi valley and the wonderful fertility of the prairie lands led to new and improved methods of agriculture. The construction of railways and canals into this territory enabled the farmers of the newer states to compete successfully in the eastern markets with those of the older states, and in a short time this competition became so strong as to compel the farmers of New England and the North Atlantic states to change both their methods and their crops.

Agricultural Education. Since the beginning of the twentieth century agricultural education has made great advancement in all civilized countries. In the United States in 1897 the income of the agricultural and mechanical colleges was $5,000,000, and in 1910 it exceeded $18,000,000. In 1897 the teaching of agriculture in rural schools was practically unknown; in 1910 it was required by law in 13 states, and efforts to teach it to some extent had been made in over 40 states and territories. The number of students in agricultural colleges is increasing each year and many of these institutions have provided graduate departments for students who desire to prepare themselves for teaching agriculture in high schools and colleges. In a number of states extension departments have been organized, and these through lecture bulletins and in some states, through correspondence courses, reach a large number of people. Some states are providing courses in agriculture in high schools, and also establishing agricultural high schools. Farmers' institutes are maintained in all states.

Agricultural Machinery. The invention and manufacture of agricultural machinery in the United States has been one of the greatest agencies in promoting agriculture and bringing it to its present degree of perfection. The first machine of importance was the cotton gin, invented by Eli Whitney in 1793. This was followed by the reaper and the thrashing machine. To these machines were added the numerous patterns of plows, cultivators, seeders, harrows and machines for dairy purposes and other branches of farm industry. The department of agriculture estimates that through these inventions the work of farm labor has been made more than twenty times as productive as it was in 1830. The use of agricultural machinery has greatly reduced the expense of leading productions and made possible the cultivation of the great farms in the Mississippi valley and the Northwest.

Division of Labor. One of the most marked results of the education of the farmer is the division of labor among agriculturists. Formerly nearly every farmer engaged in general farming; now each engages in some one line of this industry, as dairying, fruit growing, stock raising or the growing of large crops of cereals, as wheat and corn, thus adapting his farm to the industry for which it is best suited on account of soil and location with reference to the markets. This specialization has been accompanied with marked improvement in the varieties of plants and breeds of live stock. Varieties of corn and wheat especially adapted to the soil and climate of the corn and wheat belts of the United States have been perfected so that the farmers of these regions now reap the greatest possible reward for their efforts. This is also true in the development of breeds of cattle for beef and for dairy purposes, and in the perfection of the hog and various breeds of sheep (See BREEDING). With the increase of production there has been a corresponding increase in demand for American products in foreign lands, so that there has been no over-production.

See AGRICULTURAL COLLEGE; AGRICULTURAL EXPERIMENT STATIONS; AGRICULTURE, DEPARTMENT OF; FERTILIZERS; HORTICULTURE; MANURES. Consult Bailey's *Principles of Agriculture,* and James's, *Practical Agriculture.*

Agriculture, DEPARTMENT OF. The United States department of agriculture was organized in 1862 as a bureau under the department of the interior. In 1889 it was made an executive department of the government, and its secretary became a member of the president's cabinet. The department is organized into several bureaus, such as the weather bureau, bureau of plant productions, bureau of soils, bureau of forestry and bureau of chemistry. Each of these is divided into several divisions, each division carrying out its special function. These duties are closely related to the work of the agricultural experiment stations and include the following lines of investigation:

(1) Improvement in plant production. This is secured by breeding, whereby better varieties are obtained. The Illinois experiment station has improved the quality of corn to a marked degree, as has the Minnesota station the quality of wheat. Plant production is further improved by the discovery of new varieties, such as the macaroni wheat, which are better adapted to the localities than those already used; also by the introduction of new plants, like the alfalfa, into localities for which they are specially suited.

(2) The study of soils. This is for the purpose of determining the adaptation of soils to crops, and a systematic study of soils is now in progress on an extensive scale. While it will require some years to complete the work, as far as it has been carried it has given satisfactory results.

(3) The study of rotation of crops. This is of great importance in those localities where farmers are prone to raise the same crop year after year, thereby exhausting the soil.

(4) The improvement and perfection of breeds of live stock.

(5) The issue of frequent bulletins which give the results of investigations in various bureaus. The department is now issuing over 500 different documents, whose annual publication exceeds 7,000,000 copies.

The annual appropriations for the department are about $3,900,000, of which $720,000 is for state agricultural experiment stations.

One of the most important of recent changes in the department was the organization of the division of forestry into the bureau of forestry, whereby its powers were extended and its appropriations increased. The bureau now manages the forest reserves, preventing thefts of lumber and, as far as possible, forest fires. The bureau also assists farmers, lumbermen and others in managing forest lands. Except on large estates this assistance is given without charge to the owner, but the proprietors of large estates are required to pay the expenses of their assistants. See FORESTRY.

Ag′rigen′tum, now called Girgenti, a Greek city on the southern coast of Sicily, founded about 582 B. C.; in ancient times the most important place on the island, with the exception of Syracuse. That it was a powerful and magnificent city is shown by its ruins. In 405 B. C. it was almost completely destroyed by the Carthaginians, and it never regained its former splendor. During the first Punic War it was taken by the Romans and later passed into the possession of the Saracens. The population of the ancient city at the height of its splendor is supposed to have been 200,000; the population of the modern city is about 22,000.

Ag′rimony, a genus of plants belonging to the rose family, but having small yellow flowers in a large cluster at the ends of the stems. The plant grows on waysides and waste fields, stands two feet tall and bears downy, pinnate leaves. It has an aromatic odor and is bitter to the taste.

Agrip′pa. See HEROD AGRIPPA I and HEROD AGRIPPA II.

Agrippa, MARCUS VIPSANIUS (63–12 B. C.), a Roman statesman and general, the son-in-law of Augustus. He commanded the fleet of Augustus in the Battle of Actium. To him Rome is indebted for three of her principal aqueducts, the Pantheon and other public works.

A′gue. See MALARIA.

Aguinaldo, *ah′ge nahl′do,* EMILIO (1870–), the leader of the Filipino insurrection against the authority of the United States. It is not known who his parents were, but he was brought up in the home of a learned Jesuit priest in the province of Cavite. When about fifteen years of age he became a student in the medical department of the university at Manila. About 1888 he became involved in trouble with the authorities and went to Hongkong, where he came in contact with the British and received considerable information about modern methods of warfare. He is said to have served for some time in the Chinese army and as a member of the crew of a Chinese warship, under European instructors. Returning to the Philippines, he became mayor of Cavité Viejo and was acting in that capacity at the outbreak of the insurrection in 1896. Owing to the prominent part he took in this uprising, Aguinaldo was offered a large sum of money to leave the country. He accepted the terms and went into exile at Hongkong. At the outbreak of the Spanish-American war he returned to Manila for the avowed purpose of aiding the United States, but in the next year assumed the offensive against the United States. He directed the rebel forces with considerable ability, maintaining his supremacy by an unusual shrewdness, combined with great firmness of character. After a number of severe engagements, his troops became so hard pressed that they were compelled to flee to the mountains. In March, 1901, while in temporary headquarters at Palanan, Aguinaldo was captured by General Frederick Funston. He was brought to Manila, where he took the oath of allegiance to the United States and issued a proclamation to the Filipinos in which he advised them to lay down their arms and acknowledge the sovereignty of the United States. See PHILIPPINES, subhead *History.*

Agulhas, *a goo′lyas,* CAPE, in the south part of Africa, about 100 mi. e. s. e. of the Cape of Good Hope. Its highest point is 405 feet, and on the cape stands a lighthouse on an elevation of 52 feet above high water. The tower is 70 feet high, and the light is seen for over 18 miles.

A′hab, the seventh king of Israel. At the instigation of his wife, Jezebel, he erected a temple to Baal and became a cruel persecutor of the true prophets. His history may be found in the last seven chapters of *I Kings.*

Ahasuerus, *a haz′u e′rus,* in Scripture history, a king of Persia, probably the same as Xerxes, the monarch of the days of Esther, to whom the Scriptures ascribe a singular deliverance of the Jews from destruction. Ahasuerus is also a Scripture name for Cambyses, the son of Cyrus (*Ezra* IV, 6), and for Astyages, king of the Medes (*Dan.* IX, 1).

A′haz, the twelfth king of Judah, succeeded his father Jotham and ruled 736–728 B. C. Forsaking the true religion, he gave himself up to idolatry and plundered the temple to obtain presents for Tiglath-pileser, king of Assyria (*II Kings* XVI.)

Ahazi′ah. 1. The son of Ahab and Jezebel, and eighth king of Israel, who died from a fall through a lattice in his palace at Samaria, after reigning from 853 to 852 B. C. (*I Kings* XXII, 51–53). 2. The fifth king of Judah, and nephew of the above. He reigned but one year and was slain (842 B. C.) by Jehu (*II Kings* VIII, 24–29).

Aimard, *a mahr′,* GUSTAVE (1818–1883), a French novelist. He lived for ten years among the Indians of North America and wrote a number of stories dealing with Indian life, which have been popular in English translations. Among these may be mentioned *The Arkansas Trappers, Lynch Law* and *The White Scalpers.*

Ainmiller, *ine'mil ur,* MAX EMANUEL (1807–1870), a German artist who may be regarded as the restorer of the art of glass-painting. As inspector of the state institute of glass-painting at Munich he raised this art to a high degree of perfection by the new or improved processes introduced by him. A series of forty windows in Glasgow Cathedral, containing one hundred historical and Scriptural pictures, is his chief work.

Aino, *i'no,* or **Ainu,** *i'noo,* the native name of an uncivilized race of people inhabiting the Japanese island of Yezzo, also Saghalien and the Kurile Islands, and believed by some to be the aboriginal inhabitants of Japan. The Ainos average less than five feet in height, but are strong and active. They are considered the filthiest people on the globe. Their hair is black and covers the whole body and most of the face; in complexion they are dark brown, approaching to black.

Ain-tab, *ine tahb'*, a town of northern Syria, 60 mi. n. of Aleppo. It is well fortified and is an important military post. The manufactures are cottons, woolens and leather. There is here an American Protestant mission. Population, about 45,000.

Air, the gaseous substance of which our atmosphere consists. It is a mixture of about 79 parts nitrogen and 21 parts oxygen. The gases exist separately and do not unite to form a compound as oxygen and hydrogen do to form water. The oxygen is necessary to animal life, and it is that portion of the air which serves to purify the blood in respiration. The chief use of the nitrogen appears to be to dilute the oxygen. Water contains air having a larger proportion of oxygen than that found in the land, and fishes which breathe by gills obtain their oxygen from the air in the water. The properties of air are discussed under ATMOSPHERE. See also AIR BRAKE; AIR COMPRESSOR; AIR ENGINE; AIR PUMP; BAROMETER; COMBUSTION; LIQUID AIR; RESPIRATION.

Air Brake, a device for stopping cars by operating the brakes by compressed air. The principal features of this system are the air pump, installed on the locomotive just in front of the cab; the main reservoir, in which the compressed air is stored; the engineer's valve in the engine cab, by which all the operations of the air brake are controlled; the train pipe, or principal service pipe, which supplies the auxiliary air reservoirs under each car with compressed air; the triple valve, which serves to feed the compressed air into the auxiliary reservoirs and to supply the brake cylinder with air. It is this triple valve which makes the system automatic.

The air, compressed by the air pump, is led through a pipe to the main storage tank. From this air tank, a pipe leads to the engineer's valve in the engine cab, within easy reach of the engine driver. The air generally is compressed to a pressure of 90 pounds to the square inch in the main reservoir. A certain movement of the handle of the engineer's valve opens the ports which permit the air to pass into the train pipe, which runs from the locomotive under each car. This pipe is connected between the cars by a rubber hose, so that it is continuous. When the engineer wishes to apply the brakes, he throws the handle of the engineer's valve to a certain position. That opens a port which permits the air in the train pipe to escape into the open air. This lowers the pressure in the train pipe, and the balanced valve, responding to the higher pressure in the car reservoir, slides back, and thus opens an aperture which permits the air in the car reservoir to reach the brake cylinder. The pressure of the air forces the piston of the brake cylinder forward, and this piston, through suitable levers, presses the brake shoes against the wheels and the brakes are set. Within the brake cylinder is a coiled spring. When the engineer desires to release the brakes, he feeds air from the main reservoir on the locomotive into the train pipe, thus increasing the pressure. This forces the balanced valve the other way, and thus opens an aperture which releases the air in the brake cylinder into the open air. The coiled spring, reacting, forces the brake piston back to its normal condition, and thus releases the brakes.

The air brakes used on electric cars operate on the same principle, but are of simpler construction. The pump for compressing the air is operated by an electric motor which obtains its current from the wire that supplies the car motor. See AIR; AIR COMPRESSOR; COMPRESSED AIR.

Air Cells, small cavities containing air only, found in the stems and leaves of plants. They are largest and most numerous in water plants such as the lily, the leaves of which are buoyed up by their means. The minute cells in the lungs of animals are also called air cells, and there are curious air cells in the bodies of birds. These are connected with the lungs and are situated in the chest cavity and in the abdomen, and sometimes extend even into the bones. They are most fully developed in birds that have strong, powerful flight, such as the albatross. See Air.

Air Compres′sor, an air pump for forcing air into a closed vessel. The simplest form is the common bicycle pump. This has a valve in the piston opening downward, and another in the bottom of the cylinder opening outward. When the piston is raised, the cylinder below it is filled with air. When the piston is forced down, the valve in it is closed, the valve in the cylinder is forced open and the air is driven into the vessel. Whatever the size of an air compressor, it operates on this principle.

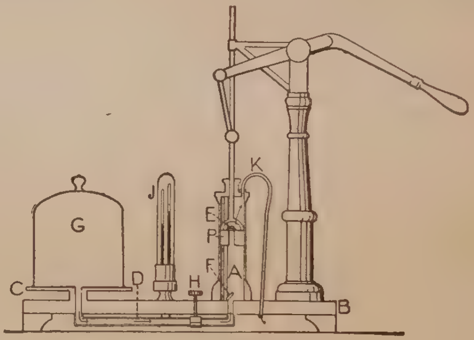
Very large air compressors, operated by water power, steam engines or electric motors, are often used in mines and tunnels for forcing a circulation of air and for supplying air to operate machine tools. In this case the air acts the same as steam in a steam engine. Some of these compressors are so powerful that they will condense the air until it exerts a pressure of three thousand pounds to the square inch. The compressed air is stored in a reservoir, from which it is drawn as required. See Air; Compressed Air.

Air En′gine, an engine in which compressed air, or air heated and so expanded, is used as the motive power. A great many engines of the former kind have been invented, some of which have been found to work quite well where no great power is required. They may be said to be essentially similar in construction to the steam engine, though of course the expansibility of air by heat is small compared with the expansion that takes place when water is converted into steam. For this reason the cylinders of air engines are much larger than those of steam engines. Engines working by compressed air have been found very useful in mining and tunneling, and the compressed air may be conveyed to its destination by means of pipes. In such cases the waste air serves for ventilation and for reducing the oppressive heat. See Air; Air Compressor.

Air Gun, an instrument for the projection of bullets by means of condensed air, generally either in the form of an ordinary gun or of a stout walking-stick, and about the same length. A quantity of air being compressed into the air chamber by means of a condensing syringe, the bullet is put in its place in front of this chamber and is propelled by the expansive force of the compressed air, which is liberated on pressing the trigger. The simplest form of air gun is the popgun, made by fitting a wooden piston to the hollow shaft of a goose quill. See Air; Air Compressor; Compressed Air.

Air Plants or **Epiphytes,** *ep′i fites,* plants that grow upon other plants or trees, apparently without receiving any nourishment otherwise than from the air. The name is restricted to flowering plants and is suitably applied to many species of orchids. The conditions necessary to the growth of such plants are excessive heat and moisture, and hence they live chiefly in the damp and shady tropical forests of Africa, Asia and America. They are particularly abundant in Java and tropical America.

Air Pump, a pump for exhausting air and other gases from a closed space, or for compressing air within an enclosed space (See Air; Air Compressor). The ordinary suction pump for raising water is constructed on the same plan and operates on the same principle as the air pump. In fact, before the water reaches the top of the pipe the air has been exhausted by the pump which pumps the water. An ordinary air pump consists of a cylinder *A*, connected by the tube *D* with a closed vessel with the receiver *G*. Within the cylinder is the piston *P*, on the upper surface of which is the valve *E*, opening upward. At the bottom of the piston is the second valve *F*, which also opens upward. *H* is a screw which opens and closes the connection between the cylinder and the receiver, and *J* is an air-tight tube containing a U-shaped tube, in which there is a quantity of mercury, connected with the receiver *G*. *C*



AIR PUMP

is the plate upon which the receiver rests. In operating the pump the piston is forced downward and the valve *E* is opened, thus transferring the air from below the piston to the space above it. When the piston is raised, the valve *E* is closed and the air is forced out through the tube *K*. The space below the piston becomes a vacuum and the expansive force of the air in *G* opens the valve *F* and fills the cylinder. With the second stroke of the piston this air is forced through the tube *K*, and to on with each repeated stroke until the air in *G* becomes so rarified that it can no longer operate the valve *F*. The difference in height in the columns of mercury in *J* indicates how perfect a vacuum has been obtained.

Many interesting experiments can be performed with the air pump. A lighted candle placed under the receiver immediately goes out when the air is exhausted, thus showing that air is necessary to combustion. A bell suspended from a silk thread can be heard when the receiver is filled with air, but when the air is exhausted it cannot be heard. This shows that air is necessary to the propagation of sound. If a glass of water be placed under the receiver, as the air is exhausted bubbles will rise to the surface of the water, showing that it contains air, which, as the pressure above is lessened, expands and rises. A shriveled apple or a prune placed under the receiver becomes plump as the air is exhausted, and a bladder filled with air will be expanded until it bursts, because of the expansive force of the air it contains. The air pump was invented by Otto von Guericke, about 1654.

Air Ship. See Flying Machines.

Aix-la-Chapelle, *ayx'lah sha pel'*, or **Aachen,** a city of Rhenish Prussia, 44 mi. w. s. w. of Cologne. The most important building is the cathedral, the oldest portion of which was erected in the time of Charlemagne, as the palace chapel, about 796. This place was the favorite residence of Charlemagne, who died in 814. A gold coffin containing his remains is to be seen in the cathedral at the present time. Thirty-seven German emperors and eleven empresses have been crowned in the city, and the imperial insignia were preserved here till 1795, when they were carried to Vienna. There are a number of warm sulphur springs here, and several mineral springs which have a reputation for curing rheumatism and other diseases. Aix-la-Chapelle is an important commercial center. The chief manufactures are cloth, gloves, leather, chemicals, linen and paints. Two celebrated treaties were signed in Aix-la-Chapelle, and a congress of the great powers was held here (See Aix-la-Chapelle, Congress of; Aix-la-Chapelle, Treaties of). Population in 1900, 135,221.

Aix-la-Chapelle, Congress of, a congress held at Aix-la-Chapelle in 1818, by which the affairs of Europe were regulated after the wars of Napoleon. Among the great statesmen present were Metternich, Castlereagh, Wellington and Richelieu. The chief thing accomplished was the withdrawal of the foreign troops from France and the recocnition of France as one of the great powers of Europe on her agreeing to the Holy Alliance. See Napoleon I; France, subhead History.

Aix-la-Chapelle, Treaties of. The first was concluded May 2, 1668, between Louis XIV of France and the Triple Alliance, including England, Sweden and Holland. Louis, after the death of Philip IV, laid claim to a large portion of the Spanish Netherlands. He had already seized several fortresses, and Holland in alarm concluded the Triple Alliance. Louis, fearing this strong combination, accepted terms by which France retained possession of the fortresses of Charlerois and Lille and gave back Franche Comté to Spain.

The second treaty was concluded in 1748, at the close of the War of the Austrian Succession (See Succession Wars). The cause of the war was the dispute of the claim of Maria Theresa to the throne of Austria. All the great powers of Europe were engaged in this war, and by the terms of the treaty the different states held nearly the same possessions as before.

Ajaccio, *a yah'cho,* the capital of Corsica, the birthplace of Napoleon, and the seat of a bishop. It has extensive coral and sardine fisheries. Population in 1901, 19,580.

A'jax, the name of two Grecian chiefs who were prominent in the war against Troy, known respectively as the Greater and the Less. Ajax the Greater was from Salamis, commanded twelve ships in the struggle against Troy and is represented by Homer as the boldest of the Greeks after Achilles. Ajax claimed the arms of Achilles after the latter's death, but they were awarded to Ulysses. Ajax became insane and after killing all the sheep of the Greeks, which in his delusion he imagined were the followers of his rival, he slew himself. Ajax the Less is remembered chiefly for his brutal treatment of Cassandra after the fall of Troy.

Ak'abah, Gulf of, a portion of the Red Sea, lying in the northwestern part of Arabia and bounded by the Peninsula of Sinai on the west. It is about 100 miles in length and 12 miles in breadth, and has high, steep shores and numerous coral reefs.

A Kem'pis, Thomas. See Kempis, Thomas a.

Ak'ka. See Acre.

Ak'ron, O., the county-seat of Summit co., 35 mi. s. of Cleveland, on the Baltimore & Ohio, the Erie and other railroads. The city lies about 500 feet above Lake Erie and the surrounding country contains numerous lakes. Many hotels have been constructed here and the district is traversed by electric railways, so that the section is becoming a popular summer resort. Natural gas is found and the Little Cuyahoga River furnishes water power for various manufactures. The products include flour, woolen goods, stoves and steam engines. One of the largest printing and publishing establishments in the world is located here. It is the seat of Buchtel College (Universalist) and the city maintains a hospital and a public library. Population in 1910, 69,067.

Alabama, *al a bah'ma,* The Cotton State, one of the Gulf states, is bounded on the n. by Tennessee; on the e. by Georgia, from the southern half of which it is separated by the Chattahoochee River; on the s. by Florida and the Gulf of Mexico and on the w. by Mississippi. Its greatest length is 330 miles, and greatest width 220 miles. The area is 51,540 square miles. Population in 1910, 2,138,093, a gain of 309,396 in ten years.

Surface and Drainage. Spurs of the Appalachian Mountains enter the northeastern part of the state from Georgia, and form low parallel ranges, nowhere exceeding 1600 feet in altitude. A low range known as the Raccoon Mountains extends northward across the state. In the east central part of the state the Lookout Mountains terminate abruptly about sixty miles from the boundary. To the southwest of these ranges is a low elevation, the Cumberland Plateau, containing rich deposits of coal and iron ore. The southern portion of the state, including three-fifths of its area, is a part of the Great Coastal Plain and is all lowland, with a deep, fertile soil.

The Tennessee River flows across the northern part of the state, forming a great bend. The valley adds much to the scenery of the region. The Mobile system drains the greater part of the state. Other important streams are the Tombigbee and its tributary, the Black Warrior, which drain the western part of the state into Mobile Bay, the only important indentation along the coast. This bay forms one of the most spacious and safe harbors of the Gulf and is an important factor in the commercial life of Mobile.

Climate. The climate varies with altitude and elevation. The northern portion of the state has a delightful climate, with a mean temperature for January of about 43° and for July about 84°. Even in winter the thermometer seldom falls below freezing point. The elevation tempers the intense heat of summer, and this portion of the state is becoming a resort for invalids and others who wish to escape the rigors of a northern winter. In the lowlands and the southern part of the state the heat is more intense and the conditions are less healthful. The rainfall in the northern portion averages 54 inches, and in the southern portion 63 inches.

Mineral Resources. The northeastern portion of the state, extending southward as far as Columbus, Ga., and westward, including the Cumberland Plateau, is rich in minerals. Within this area have been found extensive deposits of iron ore and of bituminous coal. Besides this there are also deposits of asbestos, asphalt, copper, granite, lithograph stone, marble, and pottery and porcelain clays. Salt is obtained in the southwestern portion of the state. Coal and iron are mined extensively, and Alabama is now one of the leading states in the production of iron ore, being exceeded only by Minnesota and Michigan. In the production of coal the state ranks fifth. Marble, other building stone and bauxite are also important products.

Agriculture. With the exception of the northeastern portion, where the mountains are most numerous, all of the soil is fertile, and agriculture is the most generally distributed and most important industry. In the northern half of the state wheat, corn, oats, rice and other cereals are grown, while through the central portion runs a belt of black land known as the cotton belt, and including, also, the canebrake region. Upon this land most of the cotton of the state is raised. The cotton is the most important crop, and the annual production is about 1,250,000 bales. Melons, apples and other fruits are grown in the northern half of the state, and in the southern portion the fig, pomegranate, olive, apricot and orange are found; also some sugar cane and rice.

Most of the land is held by large landholders, who have divided it into small farms which are rented to colored people.

The important forest trees in the mountain region are the oak, hickory, chestnut, cedar, elm and pine. In the low plains of the south are forests of cyprus, yellow pine and magnolia.

MANUFACTURES. The development of the iron and coal mines has led to the establishment of large manufacturing industries. These consist of smelting works, foundries and coke ovens in the mineral regions, sawmills in the forests, gristmills, leather-dressing establishments, distilleries for the manufacture of turpentine and resin and factories for the manufacture of cotton goods. Since 1900 the manufacture of iron and steel and their products, cotton goods and other products have developed rapidly.

The quarrying of marble and other building stone gives employment to considerable numbers in certain localities. Fertilizers are manufactured by combining the cotton-seed meal with phosphates which are obtained from mines in Florida. Alabama is advancing rapidly and the conditions for nearly all lines of manufacturing industry are so favorable that she bids fair to take her place in the front rank of the manufacturing states of the Union.

COMMERCE. The state has an extensive trade in coal, iron and cotton. The manufactures do not yet supply the local demands; hence many manufactured articles are brought in from other states. Fruits and lumber are exported, the latter to considerable extent; but the cereals and live stock of the state are no more than sufficient to meet the local needs.

TRANSPORTATION. The large rivers, the Alabama, the Tombigbee and Chattahoochee, are navigable for some distance. Numerous lines of railway also pass through the state from north to south and from east to west. The entire railroad mileage is about 4500 miles, and all of the leading cities and towns have railway advantages. Mobile is the only seaport, and consequently is the most important trade center for cotton, coal and lumber. A great deal of lumber is also sent to Pensacola, Fla.

GOVERNMENT. By the constitution, the right of suffrage is restricted to those who can read and write and interpret any clause of the United States Constitution in English, and who have for the greater portion of the year preceding registration been engaged in some lawful occupation, unless they own, either directly or through their wives, a certain amount of property upon which taxes have been paid. The legislature consists of a senate and house of representatives. The senate cannot exceed in number one-third of the members of the house, and members of both houses are elected for four years. The executive department consists of a governor, lieutenant governor, attorney general, state auditor, secretary of state, state treasurer, superintendent of education and commissioner of agriculture and industries. Each of these officers is elected for four years at the time of the election of members of the legislature. None is eligible for reëlection, and the governor is not eligible by election or appointment to any office in the state or the United States during his term of office, or within one year after the expiration of his term. The judicial power is vested in the supreme court, circuit courts, chancery and probate courts, and such others as may be established by law. The senate may sit as a high court of justice for the impeachment of any state officer. The local government is administered by counties and municipalities.

CITIES. The chief cities are Montgomery, the capital, Birmingham, Mobile, Selma, Anniston, Talladega and Tuscaloosa, each of which is described under its title.

EDUCATION. A good system of public schools, requiring separate schools for white and colored children, is maintained throughout the state. In 1907 a law requiring the establishing of at least one high school in each county and providing an appropriation for partially paying the salaries of teachers in these schools, was passed. The state maintains several normal schools located respectively at Florence, Jacksonville, Troy, Livingston, Montgomery, Huntsville and Tuskegee, the last three being for colored students. There is an industrial school for white girls at Montevallo. There are several agricultural schools, a number of universities and several colleges for women. Among the prominent institutions are the University of Alabama, at Tuscaloosa, Southern University, at Greensboro, Saint Bernard College, at Cullman, the Polytechnic School and Agricultural and Mechanical College, at Auburn, and the Tuskegee Normal and Industrial Institute. See TUSKEGEE NORMAL AND INDUSTRIAL INSTITUTE.

INSTITUTIONS. The hospitals for the insane are at Tuscaloosa (white) and Mount Vernon (colored). The school for negro deaf mutes and for the blind, and the Alabama Academy for the Blind are at Talladega. The penitentiary is at Wetumpka and the Alabama Industrial School for Boys is at East Lake.

History. Alabama was visited by De Soto in 1541, but was not colonized, and was a part of the British Carolina grant of 1663. The French established a settlement at Mobile Bay in 1702 and founded the present city of Mobile in 1711. Thereafter, it was the capital of Louisiana until the territory was transferred to England, when this region became a part of West Florida. After 1783 there was a serious boundary dispute with Spain and it was not definitely settled until 1819, when all of Florida was ceded to the United States. Alabama became a territory of the United States in 1817 and was admitted to statehood two years later. It was decidedly proslavery, an earnest advocate of the Mexican War and was one of the first of the Southern states to secede (January 18, 1861). Its capital, Montgomery, became the capital of the Confederate States. During the carpet-bag regime, the state suffered serious losses through reckless speculation and fraud, but since that time has steadily advanced in population and wealth. In 1901 an amendment was adopted to the constitution which practically restricted suffrage to the white citizens.

Alabama, a river of Alabama, formed by the junction of the Coosa and the Tallapoosa, a few miles above Montgomery. After a course of 300 miles, it joins the Tombigbee and assumes the name of the Mobile. It is navigable throughout.

Alabama, The, a vessel built at Birkenhead, England in 1862, by Messrs. Laird & Sons, for the Confederate States. At Terceira, one of the Azores, she received guns, stores and coal from another vessel. Captain Semmes then assumed command and on August 24, 1862, named the vessel the *Alabama* and hoisted the Confederate flag. Before September 16 she had destroyed Federal ships and provisions valued at more than her own cost, and for nearly two years afterward she was the terror of Union merchantmen in every sea. In all, she captured sixty-five vessels and destroyed property estimated at $4,000,000. Swift-sailing cruisers scoured the seas in search of her, and she was at length forced to take refuge in the port of Cherbourg, on the coast of Normandy, June 11, 1864. A few days later, the United States steamer *Kearsarge*, commanded by Captain Winslow, also arrived at Cherbourg. June 19 a fight took place outside the port, and in less than an hour the *Alabama* was sunk. Semmes and others were picked up by an English yacht.

Not many months after the *Alabama* had commenced her destructive career, Mr. Seward, secretary of state, informed the British government that the United States would claim damages for injuries done to American commerce by vessels fitted out in British ports. At length Great Britain was induced to submit to arbitration the question of her culpability in regard to the escape of the *Alabama*. A congress met at Geneva, Dec. 17, 1871, consisting of representatives of Great Britain and the United States and of three members appointed one each by the king of Italy, the president of the Swiss Confederation and the emperor of Brazil. The decision, given Sept. 15, 1872, was adverse to Great Britain, which was ordered to pay to the United States the sum of $16,145,833.

Alabama, University of, a non-sectarian, co-educational institution established at Tuscaloosa in 1831. It has about sixty professors and instructors and some over eight hundred students. Its library contains 25,000 volumes; the grounds and buildings are valued at $300,000, and its endowment fund at $300,000. Its income is about $42,600 a year. A medical school connected with the University is located in Mobile.

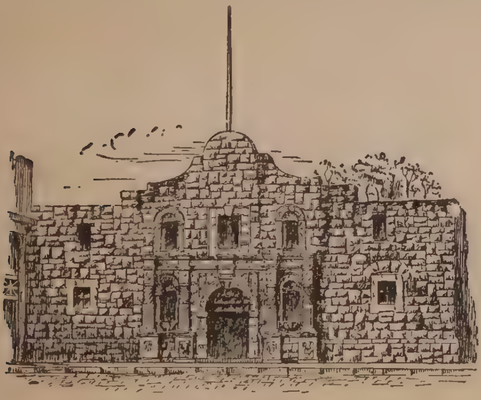
Al'abaster, a name applied to a granular variety of gypsum. It was much used by the ancients for the manufacture of ointment and perfume boxes, vases and the like. It is usually of a pure white color and is so soft that it can be scratched with the thumb nail. It is found in many parts of Europe, in great abundance and of peculiarly excellent quality in Tuscany. From the finer and more compact kinds, vases, clock-stands, statuettes and other ornamental articles are made, and from inferior kinds the cement known as plaster of Paris. A variety of carbonate of lime, closely resembling alabaster in appearance, used for similar purposes under the name of *Oriental alabaster*, is found in caves in the form of stalactites or stalagmites. It may be distinguished from true alabaster by being too hard to be scratched with the nail.

ALABASTER VESSELS

Aladd'in, the hero of one of the tales in the *Arabian Nights*. He gains possession of a wonderful lamp, which when rubbed, calls to his aid a powerful genius who is obliged to fulfill all of Aladdin's requests. Among the wonderful things which Aladdin orders the slave of the lamp to do for him is to build a palace for his bride. This is done in a single night, but later when the princess is left alone in the house, she is deceived by a magician, who gains control of the lamp and compels the slave of the lamp to carry off the palace to Africa. Another mighty genius, however, which is compelled to serve Aladdin on account of his possession of a wonderful ring, brings back the palace and regains for Aladdin the possession of the lamp.

Alameda, *ah la ma'dah,* CAL., a city in Alameda co., on San Francisco Bay and on the Southern Pacific railroad. It is a popular residence place for San Francisco business men and is the seat of the College of Notre Dame. The city contains the largest borax works in the world and extensive potteries, oil refineries and ship-building yards. Alameda was incorporated in 1854 and has grown rapidly since 1870. It owns and operates its electric lighting plant. Population in 1910, 23,383.

Alamo, *ah'la mo,* an old Catholic mission located at San Antonio, Texas, and celebrated for the battle that occurred during the war for Texan independence, in 1836. The mission was a stone structure surrounded by a strong wall over two and a half feet thick and eight feet high. Within this enclosure about 180 Texans and Americans under Colonel Travis were besieged by the Mexicans under Santa Anna. Among the company were James Bowie, David Crockett and J. B. Bonham, all prominent Texan pioneers. The attack was made so suddenly that the troops had little time to procure supplies of food or ammunition, but, notwithstanding their limited means and the superior numbers of the Mexicans, they resisted the siege for eleven days. Then Santa Anna, having received large reënforcements and heavy artillery, assailed the mission early on the morning of March 5, and overcoming a gallant resistance, in which nearly all of the inmates were killed, captured the place. Regardless of the laws of war, the Mexicans murdered in cold blood the few Texans remaining and spared only a colored man and the women and children. This atrocity incensed the Texans to the utmost limit, and for the remainder of their struggle with Mexico "Remember the Alamo" was their battle cry. The fierceness of this conflict and the peculiar circumstances attending it have given the Alamo the name of the "Thermopylae of America."



THE ALAMO

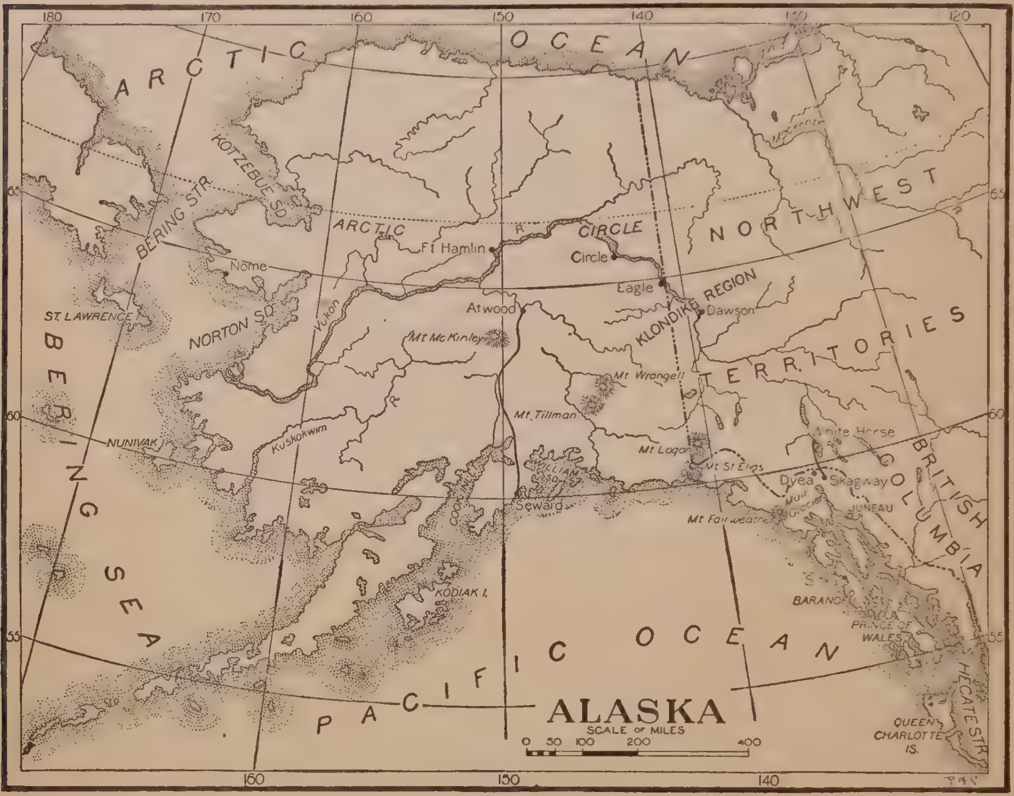
Åland, *ol'land,* **Islands,** a group of about eighty islands and numerous rocks and islets belonging to Russia, situated in the Baltic Sea, near the mouth of the Gulf of Finland. The fortress of Bomarsund was destroyed by an Anglo-French force in August, 1854. The islands were taken from Sweden by Russia in 1809. Population, about 24,000.

Alarcon y Mendoza, *ah lahr kone' e men do'thah,* DON JUAN RUIZ DE (?–1639), one of the most distinguished dramatic poets of Spain; born in Mexico. He went to Europe about 1622; in 1628 he published a volume containing eight comedies and in 1635 another containing twelve. One of them, called *The Truth Suspected,* furnished Corneille with the groundwork and greater part of the substance of his *Liar.* The *Weaver of Segovia* and *Walls Have Ears* are still performed on the Spanish stage.

Al'aric I (?–410), a famous chieftain of the Visigoths, who twice invaded Italy and besieged Rome three times. He was naturally generous, and it was owing to him that the splendid buildings of Greece and Rome suffered so little damage during his invasions. The most lasting effect of his inroads on the Western Empire was the establishment of the Visigothic Empire in Spain by the warriors whom he left behind him.

Alaric II, eighth king of the Visigoths, who succeeded his father, Euric, in 485. He preferred peace to war, but, because he was an Arian, he was obliged to contend with Clovis, who undertook the defense of orthodox Catholicism. The army of Alaric was defeated, and he was slain (507).

Alas′ka, a territory of the United States, occupying the extreme northwestern portion of North America and a narrow strip along the Pacific coast southward to British Columbia. It extends from latitude 54° 40′ to 71° 30′ north, and from longitude 130° to 168° west from Greenwich, with its farthest point 187° west. The greatest length from north to south and east to west is nearly equal, being about 800 miles; the area in round numbers is 591,000 square miles, which is more than twice the area of Texas. The western coast is extended by two large inlets, Norton Sound on the south and Kotzebue Sound on the north of Seward Peninsula, which extends within 48 miles of East Cape in Kamtchatka. The coast line has an extent of 8,000 miles, which is greater than the entire Atlantic coast line of the United States.



Surface and Drainage. The mountains and rivers divide Alaska into four districts, as follows:

1. *The Coast District,* extending along the coast from British Columbia to the beginning of Alaska Peninsula and inland to the coast range of the Alaskan Mountains. It has a width varying from 30 to 75 miles and includes a number of adjacent islands. This district is famous for its glaciers, which fill the heads of many of the narrow inlets. Those around the head of Lynn Canal and Glacier Bay are best known (See Muir Glacier). The principal rivers of this region are the Copper, with its tributary, the Chichitna, and the Matanuska, Knit and Suchitna, all flowing into Cook's Inlet. The Suchitna is navigable for about 110 miles, and its tributary, the Yetna, for about 100 miles.

The coast district is bounded on the north by the principal range of the Alaskan Mountains, which form a watershed between it and the Kuskokwim and Tanana rivers. This is the highest mountain range in North America and culminates in Mount McKinley, which has an altitude of 20,464 feet.

2. *The Alaskan and Aleutian District.* This projection is formed by a continuation of the mountains in a southwestward direction. The

chain of islands, about 150 in number, is a series of mountain peaks projecting above the sea and reaching almost to the Asiatic coast. All are extinct volcanoes, and some have an altitude of 8000 feet.

3. *The Kuskokwim District.* This includes the basin of the Kuskokwim River and contains a large area suitable for settlement.

4. *The Yukon District.* This embraces all of the territory from the southern watershed of the Yukon basin to the Arctic Ocean. In the eastern portion it is mountainous, but to the north and west it consists of a low, gradually sloping plain. The Yukon receives two important tributaries, the Tanana from the south and the Porcupine from the north. See YUKON RIVER.

CLIMATE. Each topographical district differs from the others in climate and soil. The coast district is protected from the winds from the north by the high mountain barrier that forms its inland boundary. It is also subject to the influence of the warm Pacific or Japan Current. For these reasons it has a much warmer climate than those portions of the eastern coast of the continent having the same latitude. The thermometer seldom rises above 80° or falls below zero. The condensation by the mountains of the moisture from the Pacific causes an abundance of rain, and fogs usually prevail, except in Cook's Inlet, which for some reason is free from them. The temperature of the Alaskan and Aleutian district averages a little lower than that of the Coast district, while that of the Kuskokwim has an average of zero for midwinter and of 50° for summer. The vast interior, both north and south of the Yukon, has an Arctic climate. The winters are cold and long and the summers short and warm. The Yukon is navigable only from June 15 to September 15, and the harbors on Bering Sea are blockaded with pack ice for about the same length of time as the river remains frozen, though the temperature on Norton Sound is milder than in the interior.

MINERALS. Much of the interior is still unexplored and the mineral resources are not fully known.

Coal. Coal lignite of a rather poor quality has been discovered in the vicinity of Cape Lisburne and in a number of other places along the Arctic coast, and it has occasionally been used by ships cruising in these waters. Coal is also found along the Yukon and on the Aleutian Islands, on Kenai Peninsula, at the head of Prince William Sound and in other places.

Gold. Although the presence of gold along the beds of the rivers was known to the Russians, no prospecting occurred during their occupation of the country, as it was against the policy of the government. In 1870 Americans began prospecting and soon discovered placers and veins of varying richness. The most important of these was on Douglas Island, where a mining camp was soon opened and work on the placers was begun. Soon after, rich veins of quartz ore were discovered. Permanent works for operating the mines were erected and the town of Juneau was established. These mines have been operated with profit ever since, and many other paying mines have been opened in their vicinity. On Baranof Island, near Sitka, around the head of Lynn Canal, around other islands and on the mainland, at the head of Cook's Inlet and in other places the sand and gravel on the beach are found to contain gold in paying quantities. But the most remarkable development has been in the Yukon district, where gold was discovered in 1897. This discovery led to the prospecting of the entire valleys of the Yukon and its tributaries, and valuable deposits were found, both along the river beds and among the mountains, but they are not so rich as those of the Klondike region. Following these discoveries was that on the north shore of Norton Sound, where the sands of the beach and along neighboring streams have proved extraordinarily rich. Since 1899 the output from these mines has been about $7,000,000 a year. Successful mines are in operation near Dawson, Canada, and in a few other places. The annual output of gold for the territory is about $8,500,000.

Other Minerals. Rich deposits of copper have been discovered in the Copper River country and on Prince of Wales Island, and silver ore occurs in a number of localities where gold is found. There are also petroleum beds, and on Prince of Wales Island valuable marble quarries have been opened.

VEGETATION. The islands and mainland of the Coast district are covered with dense forests of evergreen trees, which extend up the mountains to the snow line. In these forests are found thousands of square miles of white pine, cedar, fir and Alaska spruce, all of which are valuable for lumber. West of Cross Sound and in the Kuskokwim valley the growth of trees is lighter, but the mountians and hills at the head of this valley are quite heavily timbered. The valley of the Yukon contains but few trees, but during summer sustains an abundant growth of grass and other herbage. Along the Copper River are also large areas which produce luxuriant growths of grass. The tundras north of the Yukon contain little but Arctic vegetation.

ANIMAL LIFE. The animals of Alaska are numerous. Commercially, a number of them are important on account of the value of their furs. These are the mink, Alaskan fox (white and blue fox), red and black foxes, the marten, the sea otter (now nearly extinct) and the fur seal. The seal fisheries are located on and around the Pribilof Islands and are under the control of the American Fur Company, which is restricted by the United States Government from taking over 30,000 seals a year. However, the capturing of the seals in the open sea by Canadian and Japanese vessels is depleting their numbers so rapidly that they will soon become extinct if the practice is continued. The common seal and the walrus are hunted by the natives, who make use of all parts of these animals for food, clothing and other domestic purposes. The reindeer and sledge dog are of great value to the inhabitants as beasts of burden. In summer many species of birds and insects are found.

FISHERIES. The coast waters and rivers abound in fish. As yet only the salmon fisheries have been developed, and their output averages about $8,000,000 annually. The headquarters of the industry are at Kodiak Island. The cod, halibut and herring fishing grounds are thought to be more extensive than those of the Atlantic coast, and in due time the taking of these fish will become an important industry.

AGRICULTURE. Until recently Alaska has not been considered as a possible agricultural country, and it is too far north ever to attain to an important position in this industry. However, the possibilities are greater than were formerly supposed. The line which marks the northern limit of cereals extends across the territory from a little north of Eagle City to Saint Michaels. South of this, wheat, oats, rye and barley ripen, and the soil is of such fertility that it yields good crops. Garden vegetables are raised in the Yukon valley and as far north as Dawson. The abundance of wild grass assures a good hay crop, and live stock can be kept through the winter without difficulty. Large areas in the valleys of the Kuskokwim and Copper rivers and their tributaries are suitable for cultivation. A number of stock growers from Montana and other mountain states have established ranches on the Aleutian Islands, where conditions are especially favorable for grazing.

TRANSPORTATION. During the open season all ports have regular and frequent communication with the northern ports of the Pacific coast. Regular lines of steamers ply between Seattle, Valdez, Kodiak, Saint Michaels and Nome. At Saint Michaels these steamers make connection with the Yukon steamers, which ascend the river as far as Dawson. Other lines of steamers ply between Seattle and Sitka, Juneau, Skagway and other coast towns. A railway is in operation from Skagway through White Pass and is to be extended to Dawson. Most of this line is in Canadian territory. The Alaskan Central railway has been projected and partially surveyed. It is to extend from Valdez through the Copper River valley to Tanana, thence westward to Nome, and a branch will also be built eastward to connect with the line from Skagway to Dawson.

Nome is connected with Saint Michaels by cable and with Eagle City and Dawson by telegraph, and through the Canadian line terminating at Eagle City the leading settlements are in communication with the rest of the world. The United States mail is now delivered regularly at all settlements, though during the severest winter months these deliveries are at long intervals.

The commerce of the territory is growing rapidly. In 1892 the foreign trade, including exports and imports, amounted to $28,366. In 1900 it was $72,462, and it now exceeds $25,000,000 a year, exclusive of gold and silver.

GOVERNMENT. Alaska is an unorganized territory and is divided into three judicial districts with courts at Juneau, Saint Michaels and Eagle City. Some of the larger towns are allowed to organize and elect their own officers, but the judges of the district courts are empowered to appoint all commissioners, recorders, probate judges, justices of the peace and other officers connected with the administration of the laws. The land and mining laws are still very defective, and the mining laws of the United States are not well adapted to the conditions of the territory. The governor and judges of the districts are appointed by the president of the United States and confirmed by the Senate.

EDUCATION. A few schools are maintained by the United States bureau of education, for which a limited government support is granted. The larger settlements are also allowed the privilege of using a portion of the revenue obtained from licenses and other fees in support of schools. There are no higher institutions of learning in the territory.

Cities and Towns. Previous to 1897 Sitka and Juneau were the only towns of importance, but since the discovery of gold, several towns have sprung up, and some of them have grown rapidly. Sitka, on Baranof Island, is the oldest town. Juneau, at the entrance of Taku Inlet, since 1906 the seat of government, has a population of about 3,000, and is the center of a mining industry. Skagway is the seaport of the White Pass railway, and Eagle City is on the Yukon, at the point where it crosses the Canadian boundary. Nome, on Norton Sound, now has a population of 25,000. See Juneau; Nome; Sitka.

Inhabitants. The native inhabitants include three races: the Eskimos, who occupy the country north of the Yukon; the Athabaskan Indians, who inhabit the mountainous regions in the eastern portion of the valley of the Yukon and southward as far as Cook's Inlet, and the Aleuts, who occupy the Aleutian Islands. The Thilnkeets, who formerly occupied the coast and islands from Puget Sound to Yakatat Bay, are nearly extinct. In 1900 the native population numbered 29,500, more than half of whom were Eskimos. Population in 1910, 64,356, a gain of 764 in ten years.

History. The peninsula and islands of Alaska were first explored by a Dane, Vitus Bering, in the employ of Russia, in 1740. The first settlement was made on Kodiak Island in 1784, and fifteen years later, with the organization of the Russian-American Fur Company, a vigorous trade and missionary policy was adopted in the region; but the inhospitable climate led to serious financial losses, and Russia ceded the territory to the United States in 1867 for $7,200,000. In 1900 it became a judicial and civil district under the control of Congress. Two important international controversies have arisen in connection with Alaska within recent years: one, the control of the seal fisheries, the other, the boundary between Canada and Alaska. The former was based upon the claim of the United States that Bering Sea was a closed sea, subject to the control of Russia and the United States, and that unlicensed fishermen should not be allowed to kill seals, even though outside the three-mile boundary of either of these countries. The claim was referred to a commission, which decided against this contention, but also favored such restrictions on the killing of seals as would save the industry. The boundary controversy arose over the interpretation of a treaty between Russia and Great Britain, which specified that the boundary should follow the windings of the coast and should be fixed ten marine leagues inland. Was the line to be ten leagues inland from the coast of the outer islands, or from the coast of the mainland? The question was of little importance until the discovery of gold in the so-called Klondike region in this disputed territory. After several attempts to adjust the difficulty by negotiation, the question was referred to a commission consisting of three representatives of the United States and three of Great Britain. The decision was rendered in October, 1903, and was substantially in favor of the American claim. By the decision part of the gold fields recently discovered are in Canadian territory and part in American territory, but the vast Pacific coast line is wholly within the control of the United States.

Alatau, *ah'la tow'*, (mottled mountains), a name given to the range of high mountains separating Turkestan and Mongolia, and situated at the extreme north of the Central Asian great tableland. The highest point of the range is about 15,000 feet above sea level.

Al'ba Lon'ga, at one time the most powerful city of Latium, according to tradition built by Ascanius, the son of Aeneas, three hundred years before the foundation of Rome. In later times its site became covered with villas of wealthy Romans.

Albani, *al bah'ne*, Emma (Marie Louise Cecilia Emma Lajeunesse), (1851–), a soprano vocalist, born near Montreal, Canada. She studied in Paris and Milan, and made her debut in 1870 at Messina, Sicily. At that time she adopted the name of Albani in remembrance of the city of Albany, N. Y., where, when a girl, her voice attracted the attention of wealthy persons who provided for her education. She later sang in opera with great success in Europe and America. She was married in 1878 to a Mr. Gye, of London.

Alba'nia, an extensive region in the southwestern part of Turkey in Europe, stretching along the coast of the Adriatic for about 290 miles, having a breadth varying from about 100 to about 40 miles and a total area of about 20,000 sq. mi. Albania has many species of oak, poplar, hazel, plane, chestnut, cypress and laurel. The vine flourishes, together with the orange, almond, fig, mulberry and citron; maize, wheat and barley are cultivated. Its animals include bears, wolves and chamois; sheep, goats, horses, asses and mules are plentiful. The chief exports are live stock, wool, hides, timber, oil, salt-fish, cheese and tobacco, which are shipped principally from the ports of Prevesa, Avlona and Durazzo. The population is about 1,500,000.

Albany, N. Y., the capital of the state and the county-seat of Albany co., 145 mi. n. of New York and 297 mi. e. of Buffalo, is on the west bank of the Hudson River and on the New York Central, the Boston & Maine, the Delaware & Hudson, the Boston & Albany, the West Shore and other railroads. It is also connected by electric lines with Troy, Schenectady, Amsterdam and several other places. The city has a river frontage of about four miles and an extent of five miles to the west over a narrow alluvial plain along the river, where the principal business streets are located. There are about 148 miles of streets, of which 85 miles are paved. The city has eleven public parks, covering an area of 470 acres. Washington Park, the largest, has two excellent bronze statues, "Robert Burns" by Calverley, and "Moses at the Rock of Horeb" by Rhind. Rural Cemetery, Saint Agnes and Beth Emeth cemeteries are located close to the city, the tomb of President Arthur being in the first named. The most prominent structure in the city is the state capitol, which was begun in 1871 and has cost over $24,000,000. It is 390 feet long by 290 feet wide, covering an area of about three acres, and is situated on the hillside 155 feet above the river. The building is constructed of Maine granite and is considered one of the most remarkable structures in the country. On the east, from the slope of the hill, the entrance is reached by a long series of steps, while at the west end of the building there is an interior staircase which alone cost nearly $2,000,000. Facing the capitol on the west are the state hall, built of white marble, and the city hall, a Gothic structure of red sandstone. The city contains over seventy churches, of which Saint Peter's is said to be the finest specimen of the French Gothic style of architecture in the United States. All Saints' Cathedral is noted for its magnificent mosaic work. Other churches worthy of note are the Cathedral of the Immaculate Conception, the Beth Emeth Synagogue, the Madison Avenue Reformed and the First Dutch Reformed. The post office, executive mansion, state armory, Masonic Temple, Dudley Observatory, the Bender Laboratory, State Museum of Natural History and Odd Fellows' Hall are important public buildings.

The educational institutions include the State Normal College, law, dental and medical departments of Union University, the Dudley Observatory, several academies, including the Albany Academy for Girls, the second oldest institution for the education of girls in the United States, and the Albany Academy, a training school for nurses, a school for librarians and schools for the deaf. The city has a large and well-equipped hospital, two public baths and a penitentiary. The new building, now in course of erection, for the State Education Department and the State Library, which will cost about $5,000,000, will be a magnificent addition to the city.

Albany has excellent transportation facilities. Besides the railway connections mentioned above, large steamboats ascend the Hudson from New York and other points, while canals connect the city with Lake Champlain and the Great Lakes. It is an important center of passenger travel, and especially of the extensive freight traffic from the South, East and West. The leading manufactures include shirts, collars and cuffs, stoves, electrical appliances, structural iron, pianos, chemicals, cigars, paper goods, carriages, wagons, flour, boots and shoes and various other articles. Large railroad construction and repair shops, printing establishments, packing houses and breweries are also located here.

The city claims to be the second oldest permanent settlement within the limits of the original thirteen states, a trading station having been established on Castle Island in 1614, under the name of Fort Nassau. The first real settlement was made in 1624, and the name was changed to Fort Orange. When New Netherland was transferred to the English in 1664, the present name of Albany was given the settlement, in honor of the Duke of York and Albany. It was chartered as a city in 1686. Albany was made the capital in 1797, and after the opening of the Erie Canal in 1825 it grew rapidly until 1860. Since 1900 the city has manifested unwonted activity. Population in 1910, 100,253.

Albany, Ga., the county-seat of Dougherty co., is situated on the Flint River, 107 mi. s. w. of Macon and on the Albany & Northern, the Central of Georgia and other railroads. It is an important railroad center. The chief industries include cotton-pressing, brick-making and the manufacture of fertilizers. The city is an important cotton port. Population in 1910, 8190.

Albany, Ore., the county-seat of Linn co., 58 mi. s. w. of Portland, on the Willamette

River and on the Southern Pacific and other railroads. The river furnishes good water power and the manufactures include woolen goods, flour, furniture, wagons and brick. Grain and sandstone also are exported. Albany was settled in 1850 and incorporated in 1864. Population in 1910, about 4000.

Albany, *awl'ba ny,* or **Albion,** the original Celtic name probably at first applied to the whole of Britain, but later restricted to the highlands of Scotland. Formerly it gave the title of duke to a prince of the blood-royal of Scotland. Latterly the title has belonged to members of the British royal family.

Albany Convention. See UNITED STATES, subhead HISTORY.

Albany Regency. See VAN BUREN, MARTIN.

Al'batross, a large web-footed sea bird of which there are a number of species. The bill of the albatross is straight and strong, the upper mandible hooked at the point and the lower one cut off squarely. In color its upper parts are grayish-white and the belly white. It is the largest sea bird known, some measuring seventeen and a half feet from tip to tip of their expanded wings. The albatrosses are found at the Cape of Good Hope and in other parts of the southern seas, where they have been known to follow ships for whole days without ever resting. They are met at great distances from the land, where they settle down on the waves at night to sleep. Whenever food is abundant the birds gorge themselves to such a degree that they can neither fly nor swim. Their food consists of small marine animals, carrion, fish spawn, etc. Only one large egg is laid, and that is placed in a rude nest made by scraping the earth into a ridge. The young are entirely white and covered with beautiful woolly down. Sailors regard the albatross with superstition and think that to kill one brings bad luck. Coleridge used this belief as the foundation of his poem, *The Ancient Mariner.*

ALBATROSS

Al'bemarle Sound is situated in the northeast part of North Carolina, extending from the mouths of the Chowan and the Roanoke rivers north to the Atlantic coast, from which it is separated by a long island. Its length is about 55 miles, and its width from 4 to 15 miles. The water is shallow and is nearly fresh.

Al'bert, FRANCIS AUGUSTUS CHARLES EMMANUEL (1819–1861), prince of Saxe-Coburg-Gotha, consort of Queen Victoria of England, was the second son of Ernest, duke of Saxe-Coburg-Gotha. In 1840 he became the husband of the queen of England and the marriage was a most happy one. Prince Albert will always be remembered in England as a true friend of progress and of the people, and in many ways he manifested warm interest in the American government and people. See ALBERT MEMORIAL.

Alberta, *al bur'ta,* one of the former districts of the Northwest Territories of Canada. In 1905 the districts of Athabaska, Alberta, Saskatchewan and Assiniboia were combined to form the two provinces of Alberta and Saskatchewan. Alberta is made up of the district of Alberta in the south and the western portion of Athabaska in the north. The capital is Edmonton. The northern boundary is 220 miles long, the southern 175 miles, and the length of the province, 720 miles. The area is 253,500 square miles, and the population is estimated at 250,000.

Albert Ed'ward Nyan'za, a lake on the boundary line between the Kongo Free State and Uganda, Africa, which was discovered by Stanley in 1876 and named for the Prince of Wales, now King Edward VII, in 1889. It is one of the sources of the Nile and is connected with Albert Nyanza by the Semliki River.

Albert Lea, MINN., the county-seat of Freeborn co., is situated on the Chicago, Milwaukee & Saint Paul and other railroads, 108 mi. s. of Minneapolis. The industries include the manufacture of woolens, flour and foundry products. The city is the seat of Albert Lea College, for women. Population in 1910, 6192

Albert Memorial, a magnificent monument erected by the English people to Prince Albert, the husband of Queen Victoria. From the high platform rises a pedestal adorned with beautiful marble reliefs. At the four corners of the base are marble sculptures representing agriculture, manufactures, commerce and engineering. In the center of this basement is a colossal statue of the prince, seated under a canopy which is supported by granite columns. The canopy is crowned by a Gothic spire surmounted by a cross. The hall is 175 feet in height and is elegantly decorated with mosaics and with bronze and marble statues.

Albert Nyanza, a lake of east central Africa, one of the head-waters of the Nile. It is about 100 miles long and 20 miles wide. It abounds with fish and its shores are infested with crocodiles and hippopotami. This lake receives the Victoria Nile from the Victoria Nyanza, and the White Nile issues from its northern extremity.

Albigenses, *al′bi jen′seez,* so called from the district Albigeois, where they first appeared, a religious sect which sprang up in the south of France during the thirteenth century. The Albigenses professing a belief in doctrines at variance with the Church of Rome, Pope Innocent III preached a crusade against them. They persisted, however, in their heresy, slew the papal legate, Pierre de Castelnau, and war began in 1209. After many thousands had perished on both sides, a peace was concluded in 1229. Toulouse lapsed to the crown of France, and thus that country acquired the Mediterranean coast.

Albi′nos, a name given to human beings or any other animals from whose skin, hair and eyes the dark coloring matter is absent. The skin of albinos therefore, no matter to what race they belong, is of a uniform pale, milky color. Their hair is white, the iris of their eyes is pale rose color and the pupils intensely red. The absence of the dark pigment allows the multitude of blood vessels in these parts of the eye to be seen. Albinism is often noticed in the flowers of plants.

Al′bion, the same word as *Albany.* See Albany.

Albion, Mich . a city in Calhoun co., 20 mi. w. of Jackson, on the Michigan Central and the Lake Shore & Michigan Southern railroads It is the seat of Albion College. Its principal manufactures are plows carriages, harness, flour, windmills and agricultural implements. The city was first settled in 1830. Population in 1910, 5833.

Albion, N. Y., a banking post village, capital of New Orleans co., 30 mi. w. of Rochester. It is situated on the Erie Canal and on the New York Central and Hudson River railway. The manufactures are chiefly of iron and there are extensive stone quarries here. Population in 1910, 5016.

Albo′ni, Marietta (1823–1894), one of the greatest of modern contraltos, born at Cesena, Italy. She made her first visit to the United States in 1852, singing in both opera and recital. Her voice had a compass of two and a half octaves, and possessed remarkable power, sweetness and flexibility.

Albu′men or **Albumin,** a substance, or rather, group of substances, so named from the Latin term for the white of an egg, which is one of its most abundant known forms. It may be taken as the type of the protein compounds or the nitrogenous class of food stuffs. It is a compound of carbon, hydrogen, nitrogen and oxygen, with a little sulphur. It abounds in the serum of the blood and the vitreous and crystalline humors of the eye. Another variety of albumen exists in most vegetable juices and many seeds, and has nearly the same composition and properties as egg albumen. When albumen coagulates in any fluid it readily encloses any substances that may be suspended in the fluid. Hence it is used to clarify syrupy liquors. In cookery white of eggs is employed for clarifying, but in large operations like sugar-refining the serum of blood is used. From its being coagulable by various salts, and especially by corrosive sublimate, with which it forms an insoluble compound, white of egg is a convenient antidote in cases of poisoning by that substance. With lime it forms a cement to mend broken ware.

In botany the name albumen is given to the food supply which surrounds the embryo in the seed, the term in this case having no reference to chemical composition. Albumen constitutes the meat of the cocoanut, the flour or meal of cereals, the horny part of the coffee bean and the bony-like substance in vegetable ivory.

Albuquerque, *ahl′boo ker′ka,* N. M., the county-seat of Bernalillo co., 73 mi. s. w. of Santa Fé, on the Rio Grande River and on the Atchison, Topeka & Santa Fé and the Atlantic & Pacific railroads. The town lies on an elevation of 5,000 feet above the sea and is in a rich gold, silver, iron and coal mining region. It has railroad and machine shops, manufactures of iron and brick and a large trade in grain, hides and wool. The University of New Mexico, a government school for Indians and several academies are located here. The place was founded by the Spaniards in 1706 and named in honor of Albuquerque, then viceroy of New Mexico. The new part of the town, however, may be said to date from 1880. Population in 1910, 11,020.

Albert I (1875–), King of Belgium and nephew of Leopold II, whom he succeeded, December 23, 1909, is the only son of Count Phillipe of Flanders. He was carefully educated for the position he was to fill, and has also traveled extensively. In 1898 he visited the United States and made a study of our railroad systems. Later he visited the Kongo State and made a thorough study of conditions there. On his return he recommended construction of railroads and better treatment of the natives. He is devoted to the interests of his people and country.

Alcam′enes, a famous Athenian sculptor, said by some to have been the pupil of Phidias, and by others to have been his rival. His latest work is dated in 403 B. C., but his most famous works were done earlier. One of his best sculptures is *Aphrodite in the Garden*, at Athens.

Alcestis, *al ses′tis*, in Greek mythology, the wife of Admetus, king of Thessaly. In accordance with an oracle, her husband was to die unless some one could be found who would meet death in his place. His aged father and mother were asked to sacrifice themselves for him, but they refused, and Alcestis finally took upon herself the task of saving him. As he recovered, Alcestis died, but she was brought back from the gate of the tomb by Hercules, or, according to another legend, was sent back by Proserpina after her arrival in the lower world.

Alchemy or **Alchymy,** *al′ke my*, the art which in former times occupied the place of, and paved the way for, the modern science of chemistry, as astrology did for astronomy. Its aims were not scientific, being confined solely to the discovery of the means of prolonging human life and of changing the baser metals into gold and silver. Among the alchemists it was generally thought necessary to find a substance which would possess the power of dissolving all substances into their elements. This general solvent, which at the same time was to possess the power of removing the cause of disease from the human body and renewing life, was called the *philosopher's stone*, and its pretended possessors were known as *adepts*. It is thought that alchemy originated in Egypt. From Egypt the art was carried to Arabia, where in the eighth century a school of alchemy published the first known work on chemistry proper. From Arabia alchemy found its way into Europe, where the earliest genuine works on the subject are those of Roger Bacon and Albertus Magnus, written in the thirteenth century. Thomas Aquinas and Raymond Lully are also great names in alchemy. But more famous than all the others was Paracelsus, a Swiss physician, whose work was very important towards developing the manufacture of drugs. He was followed by Lavoisier, Priestley and Scheele, who, by the use of balances, tested the results of alchemy and laid down the principal ideas of modern chemistry.

Alcibiades, *al si bi′a deez*, (about 450–404 B. C.), an Athenian general and politician, the nephew of Pericles. In youth he was remarkable for his dissolute life. He came under the influence of Socrates, but even Socrates was unable to turn him from his vicious habits. After the death of Cleon he attained a political ascendency which left him no rival but Nicias. He played an important part in the Peloponnesian War, in 415 advocated the expedition against Sicily and was chosen one of the leaders; but before the expedition sailed he was accused of mutilating the statues of Hermes, on one of his midnight carouses. Rather than stand his trial he went over to Sparta, divulged the plans of the Athenians and assisted the Spartans to defeat them. Learning of a plot against his life formed by the jealous Spartan generals, he left Sparta and took refuge with the Persian satrap Tissaphernes. He began to intrigue for his return to Athens, offering to bring Tissaphernes over to the Athenian alliance, and finally his banishment was canceled. He remained abroad, however, in command of the Athenian forces, and took Chalcedon and Byzantium. In 407 he returned to Athens, but in 406 he was deprived of his command. He again sought refuge in Phrygia, and there he was assassinated.

Al′cohol or **Ethyl Alcohol** (sometimes called spirits of wine), a chemical compound appearing as a limpid, colorless liquid, with an agreeable smell and a strong, pungent taste. Alcohol has been known from great antiquity and is still used in large quantities in the arts and sciences; it forms the vital principle in all the spirituous liquors consumed in the world. It is the alcohol in them that makes wine, whisky, brandy and other liquors intoxicating, and the strength of the liquor varies with the quantity of alcohol it contains. When brandy, whisky and other spirituous liquors, themselves distilled from cruder materials, are again distilled. highly volatile alcohol is the first product to pass off. Charcoal and carbonate of soda, put in the brandy or other liquor before distillation, partly retain the fusel-oil and acetic acid it contains. The product thus obtained by distillation is called *rectified spirits* or *spirits of wine*, and contains from 55 to 85 per cent of alcohol, the rest being water. By distilling rectified spirits over carbonate of potassium, powdered quicklime or chloride of calcium, the greater part of the water is retained and nearly pure alcohol passes over. The last traces of water can be removed only by a long and varied process involving another distillation. The specific gravity of alcohol varies with its purity, decreasing as the quantity of water it contains decreases. By simple distillation the specific gravity of alcohol can scarcely be reduced below .825 at 60° F.; by rectification over chloride of calcium it may be reduced to .794; in its ordinary form it is about .820. Alcohol is composed of carbon, hydrogen and oxygen, in the proportions of 2 to 6 to 1, respectively. Under a barometric pressure of 29.5 inches it boils at 173° F.; in the exhausted receiver of an air pump it boils at ordinary temperatures. Its very low freezing-point renders it valuable for use in thermometers for very low temperatures. Alcohol is extremely inflammable, and burns with a pale-blue flame, scarcely visible in bright daylight.

DENATURED ALCOHOL. When alcohol is rendered unfit for drinking and some other special purposes, by mixing other substances with it it is said to be *denatured*. The Germans have taken the lead in the production of denatured alcohol. Their process consists in mixing with pure alcohol wood spirit, small quantities of benzol pyridin and oil of lavender or rosemary. For some purposes alcohol is only partially denatured, that is, it is rendered unfit for drinking, but otherwise may be used for all purposes for which pure alcohol is used. The United States government removed the tax on denatured alcohol in 1907, thus making it inexpensive. It is used for heat, light, power and a number of manufacturing purposes. See WOOD SPIRIT.

Al'coran. See KORAN.

Alcott, *awl'kut,* AMOS BRONSON (1799–1888), an American writer, born in Wolcott, Conn. He organized a school in Boston on a novel plan, but it did not succeed. He then went to Concord, Mass., where he became one of the leaders in the Transcendental school of philosophy (See TRANSCENDENTALISM; BROOK FARM). Mr. Alcott was widely known as a lecturer and writer on speculative and practical themes. Among his publications are *Tablets, Concord Days, Table Talk* and *Sonnets and Canzonets*. See halftone, CONCORD.

Alcott, LOUISA MAY (1832–1888), an American author, born in Germantown, Pa., the daughter of Amos Bronson Alcott. For a number of years she wrote for periodicals, while she was occupied as a school-teacher. In 1862 she served as a volunteer nurse in military hospitals, and the letters which she wrote for a newspaper during that time were later collected as *Hospital Sketches*. In 1866 Miss Alcott visited Europe and on her return wrote *Little Women*, a book that at once established her popularity. Some of her other publications have been almost equally popular, although none of them has quite the charm of her first work. Among these other books are *Little Men, Jo's Boys, An Old-Fashioned Girl, Eight Cousins* and *Rose in Bloom*.

LOUISA MAY ALCOTT

Alcuin, *al'kwin,* (about 735–804), a learned Englishman, the confidant, instructor and adviser of Charles the Great. Charlemagne became acquainted with him at Parma, invited him to court and established a school called the Palace School, which was placed in the charge of Alcuin. Most of the schools in France were either founded or improved by Alcuin. He left the court in 796 and retired to the abbey of Saint Martin of Tours, but kept up a constant correspondence with Charles to his death. He left works on theology, philosophy and rhetoric, and poems and letters, all of which have been published.

Alden, *awl'den,* Henry Mills (1836–), an American author and editor, born in Vermont. He studied at Williams College and at Andover Theological Seminary, but never entered the ministry. He married and settled in New York in 1861. His classical scholarship, as shown in his first essays and lectures, was excellent; he became managing editor of *Harper's Weekly* in 1863, and after 1869, as editor of *Harper's Magazine*, devoted himself to American literary culture. He was a collaborator in *Harper's Pictorial History of the Great Rebellion*, has written some verse and several admirable metaphysical essays, including *A Study of Death.*

Alden, Isabella McDonald (1841–), an American author, was born in Rochester, N. Y. She was editor of several religious papers, including the *Christian Endeavor World*, and wrote some serious books for adults, among which is a life of Christ; but she became best known through her stories for young people, of which she wrote more than sixty, under the pen name of *Pansy.*

Alden, John (1599–1687), one of the Pilgrim Fathers. The romantic incident of his courtship of Priscilla as the emissary of Miles Standish has been preserved in Longfellow's *The Courtship of Miles Standish*

Alden, William Livingston (1837–), an American journalist, born in Massachusetts. He graduated at Jefferson College, practiced law and then began to write for several papers. He first won attention by his humor in the New York *Times*, of which he became the London correspondent in 1893. The sport of canoeing was introduced into this country by him. He was United States consul-general at Rome from 1885 to 1889 and was honored by King Humbert. Among his books are *The Moral Pirates*, *Life of Christopher Columbus* and *A New Robinson Crusoe.*

Alder, *awl'der,* a genus of plants, of the birch order, consisting of trees and shrubs growing in the temperate and colder regions of the globe. Common alder is a tree which grows in wet places in the United States, Europe and Asia. Its wood, light and soft and of a reddish color, is used for a variety of purposes and is well adapted for such things as are kept constantly in water. The roots and knots furnish a beautifully-veined wood, well suited for cabinet work. The charcoal made from the alder wood is used in manufacturing powder. The bark is used in tanning and leather dressing; by fishermen for staining their nets and in dyeing different shades of yellow and red. With the addition of copperas, the dye becomes black.

Alderman, *awl'dur man,* Edwin Anderson (1861–), an American educator, born at Wilmington, N. C. He graduated at the state university and entered the teaching profession, becoming, successively, superintendent of city schools at Goldsboro, assistant state superintendent of instruction in North Carolina, professor in the state normal college, professor of pedagogy in the University of North Carolina, and, finally, president of that institution. In 1904 he was elected president of the University of Virginia. He is well known as an author and lecturer upon educational and historical topics.

EDWIN ANDERSON ALDERMAN

Alderney, *awl'dur ny,* a small island belonging to Great Britain, off the coast of Normandy and 60 mi. from the nearest point of England; the most northerly of the Channel Islands. About one-third of the island is occupied by grass lands, and the Alderney cows, a small-sized but handsome breed, are famous for the richness of their milk. The climate is mild and healthy. Population, about 2000.

Aldershot, *awl'dur shot*, a town and military station in northeast Hampshire, England. The great military camp there was originated in 1854 by the purchase by the government of a tract of moorland known as Aldershot Heath, within the limits of Surrey, Hampshire and Berkshire. Population in 1901, 31,000.

Al'dine Editions, the name given to the works which came from the press of Aldus Manutius and his family at Venice (1490–1597). They gained the respect of scholars and the attention of book-collectors by their scholarliness and their excellent typography. Many of them were the first printed editions of Greek and Latin classics, while others were texts of Italian authors.

Aldrich, *awl'drich*, NELSON WILMARTH (1841–), an American politician, born in Rhode Island. He was a member of the assembly in 1875 and was elected to Congress in 1878 and again in 1880. In 1881 he resigned to enter the United States Senate as a Republican to succeed General Burnside, and was reëlected in 1886, 1892, 1898 and 1904. He became known as a leader of the conservative part of the Republican party.

Aldrich, THOMAS BAILEY (1836–1907), an American editor, story-writer and poet. He was for a short time in a New York banking house, but he found his work uncongenial and turned his attention to literature. His first work was done on the staffs of various New York periodicals. From 1881 to 1890 he was editor of the *Atlantic Monthly*. Among Aldrich's best known works are the poems *The Ballad of Babie Bell, Cloth of Gold, Flower and Thorn* and *Unguarded Gates;* while among his prose works perhaps the best known are *The Queen of Sheba, The Story of a Bad Boy, Marjorie Daw* and *Prudence Palfrey*. His prose, like his verse, is light and graceful, but is not distinguished by great depth or power.

Ale, a liquor in which the process of fermentation has been stopped before all the sugar is changed to other compounds. This sugar is changed by later fermentation in the barrel into alcohol and carbonic acid, and this change makes ale stronger than beer. The strength of ale depends upon the time given it in which to cure; for mild ale, this is one week; for pale ale, from two to four months, and for strong ale, from ten to fifteen months. See BREWING.

Alembert, *a lahN bare'*, JEAN DE ROND D'. See D'ALEMBERT, JEAN DE ROND.

Alencon, *a len'sone*, or (Fr.) *a lahN soN'*, a town of France, capital of department Orne, on the right bank of the Sarthe, 105 mi. w. of Paris. It was long famed for the manufacture of point-lace, called point d'Alençon. Fine rock-crystal, yielding the so-called Alençon diamonds, is found in the neighboring granite quarries. Population in 1901, 14,886.

Alep'po, a city of Asiatic Turkey in north Syria, the capital of the province of the same name, 70 mi. e. of the Mediterranean. In 1170 the city was captured by the Crusaders, and in 1516 it came under the power of the Turks. Aleppo has suffered severely from earthquakes and plagues, but it is now a very prosperous city and has an extensive commerce by caravan with Bagdad and other eastern places. Its most important manufactures are costly silks, flowered and woven with gold and silver threads. Population, about 100,000.

Aleutian, *a lu'shan*, **Islands**, a group of islands formed by the extension of the peninsula of Alaska, and separating Bering Sea from the Pacific Ocean. There are about 150 islands in the group, and they were formerly known as the Catherine Archipelago. The chain is in the shape of an arch. Most of the islands are small and all have rugged or mountainous surfaces. Hot springs are common, but some of the larger islands contain cool springs and rapid streams. Those containing soil are covered with growths of shrubbery, grass, moss and lichens, but there are no large trees. Until recently it was supposed that these islands were unsuited to any form of agriculture, but the largest have been found well adapted to the raising of live stock, and since 1900 several ranches owned by residents of the United States have been established upon them. The natives are known as Aleuts, and are a branch of the Eskimo stock. See ALASKA.

Alexan'der, the name of eight popes, the earliest of whom, Alexander I, is said to have reigned from 109 to 119. The most famous is ALEXANDER VI (Rodrigo Borgia, 1431–1503), born at Valencia, in Spain. He was in his early youth a handsome and gallant courtier, practiced alike in all the vices and graces of his time, but he soon developed remarkable executive ability and at the age of twenty-five was appointed a cardinal by his uncle, Pope Calixtus III. At the death of Innocent VIII he became pope. He set himself the task of reducing the power of the Italian princes and increasing the papal revenues. Endowed with sagacity and fearlessness, he accomplished all he undertook. Among the events of his reign are the introduction of the *Index Expurgatorius* (index of prohibited books), the partition of the New World between Portugal and Spain, and the death of Savonarola. ALEXANDER VIII, the last pope of the name, ruled from 1689 to 1691. He was a Venetian and assisted the Venetians in a war against the Turks.

Alexander, the name of three Scottish kings. ALEXANDER I (about 1078–1124), a son of Malcolm Canmore and Margaret of England, was a great benefactor of the church and a firm vindicator of the national independence. ALEXANDER II (1198–1249) succeeded his father, William the Lion, in 1214. He gave aid to the English barons in their struggle with King John for the securing of the Magna Charta. ALEXANDER III (1241–1285) succeeded his father, Alexander II, in 1249. He brought the Hebrides and the Isle of Man under his sway by the defeat of the Norse king Hakon, in 1263. Alexander was strenuous in asserting the independence both of the Scottish kingdom and the Scottish church against England. Under him Scotland enjoyed greater prosperity than for generations afterward.

Alexander the Great, (356–323 B. C.), king of Macedon, the greatest character in history before the Christian era. In early youth Alexander gave evidence of invincible courage, wonderful strength and endurance and boundless ambition. At the age of thirteen he became a pupil of Aristotle. During the lifetime of his father, Philip of Macedon, he shared in the wars for the supremacy of Macedon over the neighboring states of Greece, and on the assassination of his father he came to the throne, at the age of twenty. He put to death several of the murderers of his father and the latter's second wife and infant son. The conditions under which his reign began were far from favorable. His youth and inexperience led the Greek states to think that a revolution would be an easy thing, and the first two years of his reign were chiefly occupied in subduing the revolting cities of Greece and hostile tribes beyond the northern frontier of Macedonia. While he was absent in Thrace it was reported that he had been slain, and a considerable revolt was begun anew in Greece, with Athens and Thebes as its center. Alexander appeared before the latter city; the allies of Thebes, including Athens, deserted her, and the city was taken by storm and totally destroyed, the house of the poet Pindar alone being spared. The remaining states of Greece were pardoned.

In the spring of 334 Alexander set out for the conquest of the Persian Empire. With an army of thirty-five thousand he crossed the Hellespont, and at the Granicus he totally defeated a Persian force, thereby opening the gate to all Asia Minor. The next year the invading force met a vast Persian army numbering 600,000 on the plain of Issus, and the Persians were again routed. Alexander next turned his attention to Phoenicia, and soon the whole of Syria and Phoenicia submitted to him, excepting the famous city of Tyre, which was taken after a siege of seven months (332). The population of eight thousand was exterminated. The capture of Tyre is considered the greatest of Alexander's military operations. The next conquest was that of Egypt, which submitted to him gladly as a relief from Persian rule. At one of the mouths of the Nile the conqueror founded the city of Alexandria, which became an important factor in the commerce of the Mediterranean. He next proceeded to the famous temple of Jupiter Ammon, in the Libyan desert, and there he had himself declared a son of Jupiter. He then turned his army eastward, to complete his overthrow of the Persian Empire. At Arbela he met the army of the Persians, numbering more than a million, and fought one of the decisive battles of the world, in which he was again successful. He entered Babylon and Susa, which threw open their gates to him, and in the latter city seized for his own use the rich royal treasure of silver and gold.

ALEXANDER THE GREAT
Berlin.

Alexander was now regarded by himself and by the Persians as the successor of Darius, who had been slain in the battle at Arbela. The victorious army was next led northward for the subjugation of various tribes about the Caspian Sea, and thence across the Hindu Kush into Bactria and Sogdiana. In 327 Alexander led his army to India, where all the native princes submitted except Porus, a powerful king north of the Indus, who was defeated. Alexander rediscovered the sea-route from the Indus to the Euphrates via the Indian Ocean, an achievement of great importance for the commerce of India. He made Babylon the capital of his vast empire. By means of colonies and intermarriage the peoples of Europe and Asia were to be fused into a single great nation, having common laws, language and ruler. He himself married a daughter of King Darius, and thousands of his soldiers took Asiatic wives. In the midst of his vast projects Alexander was seized by a fever and died at Babylon. Of the generals among whom his vast domain was divided, the most famous was Ptolemy, who founded in Egypt the line of rulers of that name.

Alexander's title to greatness lies in his military achievements. His insatiate vanity and unchecked excesses are a serious blemish. His uncontrolled passion led him to commit deeds, such as the murder of his dearest friend, Clitus, which he bitterly repented. It is said that he never asked his soldiers to do what he would not do himself. He was a man of fine tastes and a liberal patron of art, philosophy and literature. The effects of his conquests were the ending of the struggle between Greece and Persia and the spreading of Hellenic civilization over Egypt and western Asia. The story of Alexander's life and conquests is told in many ancient annals and in the romances and legends of many nations.

Alexander I (1777–1825), emperor of Russia, son of Paul I. On the assassination of his father in 1801, Alexander ascended the throne and concluded peace with Great Britain, against which his predecessor had declared war. The Russian emperor identified himself with the Napoleonic schemes and obtained possession of Finland and territory on the Danube. The French alliance was too oppressive, and Alexander's withdrawal from it led to the French invasion of 1812. In 1813 he published a manifesto which served as the basis of the coalition of the European powers against France. After Waterloo, Alexander, accompanied by the emperor of Austria and the king of Prussia, made an entrance into Paris, where they concluded the treaty forming what is known as the Holy Alliance (See HOLY ALLIANCE). In the early part of his reign Alexander showed liberal tendencies and instituted various reforms; but after the formation of the Holy Alliance he was largely influenced in his policy by the reactionary doctrines of Metternich.

Alexander II (1818–1881), emperor of Russia, who succeeded his father, Nicholas I, in 1855, before the end of the Crimean War. After peace was concluded the new emperor set about effecting the emancipation of the serfs in 1861, a measure which gave freedom, on certain conditions, to over twenty-two million human beings. Under him, too, representative assemblies were introduced, and he did much to improve education and to reorganize the judicial system. The latter part of his reign witnessed a return to the despotism usually characteristic of the czars, and the result was an ever increasing number of Nihilist risings. Alexander was killed by an explosive missile flung at him by a Nihilist in a street in Saint Petersburg, March 13, 1881. During his reign occurred the Russo-Turkish War, the result of the ambitious Russian designs on Turkish territory.

Alexander III, ALEXANDROVITCH (1845–1894), emperor of Russia, succeeded his father Alexander II, in 1883. His intention was to pursue a more liberal course than his father had done and he had in fact before his accession come into conflict with his father through his opposition to reactionary methods. However the excesses of the Nihilists finally forced him to make his reign as despotic and conservative as was that of his father. Nihilism was sternly repressed, but despite this fact several attempts were made on his life. With regard to foreign affairs his policy was one of peace, but he followed the old Russian policy of interfering in the Balkan States. He was succeeded on his death in 1894 by his eldest son, Nicholas.

Alexander, WILLIAM (1726–1783), an American soldier, called Lord Stirling, born in New York City. He served in the French and Indian War, and at its close went to England, where he presented his claim to the earldom of Stirling before the British House of Lords, but without success. On the outbreak of the Revolution he joined the colonial army, and at the Battle of Long Island he was taken prisoner. Within the year he was exchanged, and in 1777 he was made a major general. Alexander was one of the founders of King's College (now Columbia), and became its first president.

Alexander Nevski (1222–1263), a Russian hero and saint. He fought against the Mongols, the Danes and the knights of the Teutonic order, and in 1240 gained a splendid victory on the Neva over the Swedes. His countrymen commemorated him in popular songs and raised him to the dignity of a saint; Peter the Great built a splendid monastery at Saint Petersburg in his honor and established an order which bears his name.

Alexander Severus (205–235), a Roman emperor. He was raised to the imperial dignity in 222 by the praetorian guards, and governed ably both in peace and war, although he was not a man of great strength of character. When on an expedition into Gaul to repress an incursion of the Germans, he was murdered with his mother in an insurrection of his troops, headed by the brutal Maximin, who succeeded him as emperor.

Alexan'dra (1844–), queen dowager of England, and daughter of Christian IX of Denmark, was born at Copenhagen. She was married to Albert Edward, Prince of Wales and heir to the British throne, March 10, 1863. Her first public act was the opening of the Cambridge School of Art, in 1865, and she was present at the opening of Parliament in 1866. After the death of the Prince Consort, in 1861, Queen Victoria practically withdrew from society, and this made the Princess of Wales the first lady of the country in social matters, a position which she sustained to the satisfaction of all. At the coronation of Edward VII, August 9, 1902, Alexandra was crowned queen. She is noted for her domestic virtues and universal kindness.

Alexan'dria, an ancient city and seaport in Egypt, at the northwest angle of the Nile delta, on a ridge of land between the sea and Lake Mareotis. Ancient Alexandria was founded by, and named in honor of, Alexander the Great, in 332 B. C., and was long a great and splendid city, the center of commerce between the East and West, as well as of Greek learning and civilization, with a population at one time of perhaps 1,000,000. It was especially celebrated for its great library and also for its famous lighthouse, one of the wonders of the world (See LIGHTHOUSE). Under Roman rule it was the second city of the Empire, and when Constantinople became the capital of the East it still remained the chief center of trade; but it received a blow from which it never recovered when captured by Amru, general of Caliph Omar, in 641, after a siege of fourteen months. Its ruin was finally completed by the discovery of the passage to India by the Cape of Good Hope, which opened up a new route for the Asiatic trade (See ALEXANDRIAN LIBRARY, ALEXANDRIAN SCHOOL; PHAROS).

Modern Alexandria is built on a peninsula which was formerly the island of Pharos. It is divided into two parts, one of which is inhabited by Mohammedans and the other by Europeans. The latter portion is the better built, and it is here that the finest houses are situated, and also the principal shops and hotels, banks and offices of companies. This part of the city is supplied with gas, and with water brought by the Mahmudieh Canal from the western branch of the Nile. Alexandria is connected by railway with Cairo, Rosetta and Suez. A little to the south of the city are the catacombs, which now serve as a quarry; other relics of antiquity are Pompey's Pillar, 98 feet 9 inches

ALEXANDRA, QUEEN OF ENGLAND

high, and a palace built by Mohammed Ali. Alexandria has two ports, with fine docks and other accommodations. It is one of the chief commercial ports on the Mediterranean and the great emporium of Egypt. The trade of Alexandria is large and varied, the exports being cotton, beans, peas, rice, wheat; the imports, chiefly manufactured goods. At the beginning of the nineteenth century Alexandria was an insignificant place of 5000 or 6000 inhabitants. The origin of its more recent career of prosperity it owes to Mohammed Ali. In 1882 the insurrection of Arabi Pasha and the massacre of Europeans led to the intervention of the British and the bombardment of the forts by the British fleet, in July. When the British entered the city they found the finest parts of it sacked and in flames, but the damage was repaired. Population in 1902, 310,587.

Alexandria, Ind., a city in Madison co., 48 mi. n. e. of Indianapolis, on the Big Four and the Lake Erie & Western railroads. It has paper mills, iron and steel works, and extensive glass factories. Alexandria owns and operates its waterworks. The place was settled in 1834. Population in 1910, 5096.

Alexandria, La., the parish-town of Rapides parish, 100 mi. n. w. of Baton Rouge, on the Red River and on the Southern Pacific, the Texas Pacific and other railroads. The city has important commercial and manufacturing interests, including cotton and its products, molasses, sugar and hides. A convent of the Sisters of Mercy is located here, and a large national cemetery lies across the river. Before the Civil War the state university was located just above the city. Alexandria was settled in 1820 and incorporated twenty years later. It now owns and operates the waterworks and electric lighting plant. Population in 1910, 11,213.

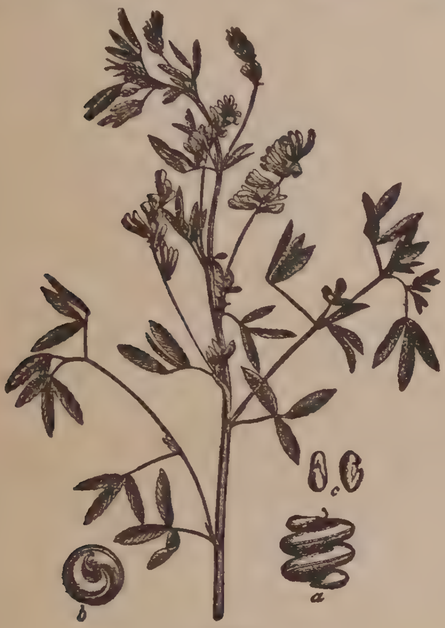
Alexandria, Va., the county-seat of Alexandria co., on the Southern, the Pennsylvania, the Baltimore & Ohio and other railroads, and on the Potomac River, 100 mi. from its mouth and six miles below Washington. The harbor is here a mile wide and sea-going vessels come up to the city. There is a large and increasing trade and the manufactures include shoes, flour, machinery, fertilizers, glass, chemicals and brick. A Protestant Episcopal theological seminary and several high schools and academies are located here. In 1755 General Braddock made his headquarters in the city. The inhabitants became frightened by the approach of the British fleet in 1814, and raised a large contribution to secure freedom from attack. During the Civil War the city was occupied by Federal troops and was the capital of that part of Virginia which remained loyal to the Union. Population in 1910, 15,329.

Alexandrian Library, the largest and most famous of all the ancient collections of books, planned by Ptolemy Soter, king of Egypt, who died about 283 B. C. His son Ptolemy Philadelphus and succeeding rulers developed and enlarged the library which at its most flourishing period is said to have numbered 700,000 volumes. Many of the books were purchased in Athens, Rome and other countries. The main library was located in the temple of Serapis. Most of the books were burned at the invasion of Alexandria by the Romans under Julius Caesar, and the remainder were destroyed by the Christians in 391 A. D.

Alexandrian School or **Alexandrine School,** the school or period of Greek literature and learning that existed at Alexandria in Egypt during the three hundred years that the rule of the Ptolemies lasted (323–30 B. C.), and continued under the Roman supremacy. Ptolemy Soter founded the famous library of Alexandria, and his son, Philadelphus, established a sort of academy of sciences and arts. Many scholars and men of genius were thus attracted to Alexandria, and a period of literary activity set in, which made Alexandria for a long time the focus and center of Greek culture and intellectual effort. Among the grammarians and critics were Eratosthenes, Aristophanes and Aristarchus. Their chief merit lies in having collected, edited and preserved the existing monuments of Greek literature. Among those who pursued mathematics, physics and astronomy were Euclid, the father of scientific geometry; Archimedes, great in physics and mechanics; Apollonius of Perga, whose work on conic sections still exists, and the astronomer and geographer, Ptolemy, whose system of astronomy was in general use until the middle of the seventeenth century. There were also several poets and philosophers of note attached to the school. The Alexandrian School is noted for its criticism and for reproducing works of Greek authors in permanent and finished form. Because of this its influence extended through many centuries and is even felt in the classic culture of the present time. See Alexandrian Library.

Alex'ius Comne'nus or **Alexis Comnenus** (1048–1118), Byzantine emperor. See Byzantine Empire.

Alfal'fa, a name given to a forage plant, one of the most valuable of the clover-like plants grown as green food for cattle. It is sometimes known as *lucerne*. Alfalfa is a native of the south of Europe, and has been cultivated there from the earliest times. It is largely cultivated in parts of North and South America, and is especially adapted to the Southern and Western states. It is the best of all forage crops in a drought, for its strong roots penetrate deep into the ground. It delights in a rich limy soil, and never succeeds on damp soils or sticky clays. It is a *perennial,* and if kept free from weeds affords good crops for six, seven or more years. It is sown broadcast or in rows, the latter being considered the better method. It may be mown several times in a year, as it grows very quickly after being cut. Sometimes from ten to fifteen tons per acre are raised annually, and few other forage plants are ready for use so early in spring. Alfalfa has a rather erect stem; leaves with three rounded, toothed leaflets; purplish-blue or sometimes yellow pear-shaped flowers, in many flowered clusters. Its pods are twisted two or three times round.



ALFALFA
a, b, seed pods; *c,* seeds.

Alfieri, *al fya're,* Vittorio, Count (1749–1803), an Italian poet. After extensive European travels he began to write, and as his first play, *Cleopatra,* was received with general applause, he determined to devote all his efforts to attaining a position among writers of dramatic poetry. He gave up everything for his work, even making over his property to his sister, that he might be bound by no ties of home and country. He died at Florence and was buried in the church of Santa Croce, between Machiavelli and Michelangelo, where a beautiful monument by Canova covers his remains. His tragedies and comedies, while stiff and unnatural, are full of lofty sentiments. He is considered the first tragic writer of Italy and has served as a model for his successors. Alfieri composed also an epic, lyrics, satires and poetical translations from the ancient classics. His autobiography is of peculiar interest as a frank, sincere account.

Alfon'so XIII, (1886–), king of Spain, son of Alfonso XII. Alfonso XII died before the birth of his son, and Maria Christina acted as regent until her son came of age and formally began his reign in 1902. During the regency, affairs in Spain were in a most disturbed condition, and in 1898 a war between Spain and the United States lost to Spain practically all of her colonies. After that time order was gradually restored, and the country began to recover its prosperity. Alfonso was married in May, 1906, to Princess Ena of Battenberg, a granddaughter of Queen Victoria of England and a distant cousin of Emperor William II of Germany.

Alford, *al'furd,* Henry, D. D. (1810–1871), an English poet, scholar and miscellaneous writer. He wrote an edition of the Greek Testament, with commentary, which occupied him for almost twenty years. In 1857 he was appointed dean of Canterbury. Among other things he wrote *Chapters on the Poets of Ancient Greece, Homilies on the Acts of the Apostles, Letters from Abroad, The School of the Heart and Other Poems* and *A Plea for the Queen's English.*

Al'fred the Great (849–901), king of the West Saxons. He was the youngest son of Ethelwulf, who reigned from 836 to 858. Alfred came to the throne in 871, the intervening thirteen years having been occupied by the reigns of his three older brothers. At his accession Alfred found the country in a desperate state, owing to the inroads of the Danes. He made a truce with them and induced them to turn their attention to the other provinces of Britain, but it was not long before they renewed hostilities. So successful were their attacks that Alfred, in despair, fled to the hills and woods for safety. It is to this period that the familiar legend of the burning cakes belongs. He constantly planned and worked toward the driving out of the Danes, and after he had been joined by a band of trusty followers he made repeated sallies against the enemy's possessions. In May, 878, he prepared to attack the Danish army under Guthrum at Edingdon. It is said that two or three days before the battle he entered the Danish camp disguised as a gleeman and gained all the information desired respecting their strength and position. In the battle that followed, the Danes were utterly defeated. Guthrum and his followers accepted Christianity and were assigned territory north of Wessex. Alfred afterward ceded to them the eastern portion of Mercia, which became known as the *Danelagh*. Alfred was now the ruler of nearly all England, though never recognized by title as such.

During the period of peace which followed, he rebuilt cities and fortresses and improved his fleet. Ships were stationed at intervals along the coast to guard against invasion and they were often useful in repelling the renewed attacks of the Danes. It is to this period that Alfred's most important government reforms and literary labor belong. He established a regular militia, which was able to protect the several parts of the kingdom without leaving any district defenseless; made a code of laws which served as the basis of later codes, and promoted trade and commerce. His last years were passed in peace. He was succeeded by his son, Edward the Elder.

Of all the monarchs to whom the title of "Great" has been given, none deserves it, in point of character, as does Alfred. The selfish ambition and cruelty which have stained the characters of other great rulers are not recorded in his life. In the making and administration of laws, in his careful oversight of the courts of justice, in his promotion of the arts of peace, he had the welfare of his subjects ever in view. He was blessed with signal good judgment in choosing his advisers. Of his military genius, the record of obstacles patiently combated and victoriously overcome is sufficient witness. He was in belief and in practice a devout Christian; for many years he suffered uncomplainingly the ravages of a dread, mysterious disease. Alfred is conspicuous for the patronage he gave to letters, and his own learning and industrious scholarship are most remarkable. To bring knowledge within reach of his subjects he translated Bede's *Ecclesiastical History of England*, Gregory's *Pastoral Rule* and Boethius's *Consolations of Philosophy*, from Latin into Anglo-Saxon, adding much of his own composition. It was during his reign that the valuable *Anglo-Saxon Chronicle* assumed a systematic form. Alfred represents all that is greatest and best in the early Christian civilization of the West, and was the herald of centuries far removed from him in point of time.

Algae, *al'je*, an order of plants, found for the most part in the sea and fresh water, and comprising seaweeds and other common forms. The higher species have stems bearing leaf-like expansions, and they are often attached to the rocks by roots, which, however, do not derive nutriment from the rocks. The stem is frequently absent, the plants being nourished through their whole surface by the medium in which they live. They vary in size from the microscopic diatoms to forms whose stems resemble those of forest trees, and whose fronds rival the leaves of the palm. They are entirely composed of cellular tissue, and many are edible and nutritious, as carrageen, or Irish moss, dulse, etc. Kelp, iodine and bromine are products of various species. The Algae are also valuable as manure. About twelve thousand species are known and these are classified in groups according to their color, being recognized as green, brown or red. Most green algae are fresh water plants (one kind is found on walls, walks and the north side of trees); the brown and red algae are usually confined to salt water.

Algebra, *al'je brah*, a branch of mathematics which treats of the relation and properties of numbers by means of symbols. It has been called generalized arithmetic, since it is concerned with the discovery of the general processes and principles which arithmetic applies to particular cases. The following examples will illustrate the use of algebraic symbols: $ax+by+cz$ denotes that a number represented by x is to be multiplied by a number represented by a; a number represented by y is to be multiplied by a number represented by b; a number represented by z is to be multiplied by a number represented by c, and these products are to be added together. Known quantities are usually represented by numerals or by the first letters of the alphabet, as a, b, c; unknown quantities are usually represented by the last letters of the alphabet, x, y, z. The field of alegbra includes the application of all fundamental processes to quantities represented by algebraic symbols—addition, division, multiplication, subtraction, involution, evolution—and besides, in its most general sense, involves the study of the solution of so-called *equations*, though this branch of algebra has recently become a separate study in itself.

An elgebraic equation expresses the value of one or more unknown quantities by expressing the equality between that value and a known quantity. If there is but one unknown quantity in the equation the expressed relation or value can be determined (that is, the equation can be *solved*) by means of a single equation. If there is more than one unknown quantity in the equation, in order to solve the equation or determine the value of the unknown quantities there must be as many equations as there are unknown quantities, each equation expressing the relation between them. By comparing these relations the value of the unknown quantities can be determined. This comparison is made in various ways in conformity to certain axioms and principles (See Axiom). The method used to determine the unknown quantity is called *elimination*, since in every case the object is to create an equation containing but one unknown. When one unknown is treated as a known, the other is expressed in terms of the first and this expression is substituted for the second wherever it occurs, the process is called *elimination by substitution*. When one unknown quantity is treated as a known in two equations and two values for the other unknown are thus found which are placed equal to each other, forming an equation with but one unknown quantity, the process is known as *elimination by comparison*. When each of the equations is multiplied by such a factor that the coefficients of one unknown in both equations become numerically equal and the equations are then added together or one substracted from the other, leaving an equation of but one unknown quantity, the process is *elimination by addition or subtraction*.

The science of algebra practically began with the Greeks, the first systematic treatise being written by Diophantus about 350 A. D. An example of the problems considered by this author is, to find two numbers the sum of whose squares is a square. Algebra was improved and developed at the hands of the Arabs and about the thirteenth century was introduced into Italy, probably by the Moors who had invaded Spain. About the beginning of the sixteenth century a German, Stifel or Stifelius, by introducing many of the modern symbols, greatly simplified the processes of algebra and led to its rapid development. Of later mathematicians who have added important elements to the science are Vieta, Descartes, who extended algebraic methods to geometry (See Analytical Geometry), Euler, Newton, Liebnitz and Lagrange.

Algeciras, *al je si'ras*, a seaport of Spain in the province of Cadiz, on the west side of the Bay of Gibraltar. It is well built and has a strongly protected harbor. It was the first conquest of the Arabs in Spain, in 711, and was held by them till 1344, when it was taken by Alphonso XI of Castile, after a siege of twenty months. Near Algeciras, in 1801, the English admiral Saumarez defeated the combined French and Spanish fleets, after having failed in an attack a few days before. In 1906 at Algeciras was held the Moroccan conference, which was called to settle whether German or French influence should be paramount in Morocco. Population in 1900, 13,302.

Alger, *al'jer*, Horatio (1834–1899). an American author of books for young people. His works, which are numerous and very popular, deal largely with the life of self-supporting boys. They include *Ragged Dick*, *Tattered Tom* and *Luck and Pluck*.

Alger, Russell Alexander (1836–1907), an American soldier and statesman, born in Ohio. At fourteen years of age he began to work as a farm laborer at $3 a month. He received a fair education, was admitted to the bar in 1859 and began to practice at Cleveland. Shortly after, the Civil War broke out; he enlisted in the Second Michigan cavalry and served successively as captain, major and lieutenant colonel. He resigned from the army in 1864, and settled in Detroit, becoming interested in the lumber trade. In 1884 he was elected governor of the State of Michigan, and in February, 1897, was selected by President McKinley as his secretary of war, which position he resigned August 1, 1899. His administration was vigorously criticised. He was appointed United States senator in 1902 and was elected in 1903.

Alge'ria, a French colony in North Africa, having an area of about 184,000 sq. mi. The country is divided politically into three departments: Algiers, the center of the European commerce and colonization; Oran, next to Morocco, and Constantine, next to Tunisia. The Atlas Mountains traverse the country in two ranges, one of which is parallel to the coast and the other farther inland. The latter attains an elevation of 7,000 feet. The climate varies according to elevation and local conditions. There are three seasons: winter, from November to February; spring, from March to June, and summer, from July to November. In general the summer is hot and dry, but in many places along the coast the temperature is moderate; in winter the climate is so pleasing that Algeria is an important health resort.

The chief agricultural products are wheat, barley, oats, tobacco, cotton, wine, silk and dates. Early vegetables are also raised in considerable quantities and exported to France and England. Algeria is also the home of the esparto grass, extensively used in the manufacture of paper. The forests contain pine, oak, ash, cedar, myrtle and a number of different gum trees. A large quantity of lumber is produced, and Algeria ranks sixth among the lumber-producing countries under European jurisdiction. It is also an important wine-producing country. There are valuable deposits of iron, copper, lead, sulphur, zinc, antimony and marble.

In addition to the exports mentioned above, wine, olive oil, hides, wood, wool, tobacco, oranges and other fruits are exported. The imports consist of manufactured goods, coffee, furniture, machinery and coal. The manufacturing industries are unimportant, but include morocco leather, carpets, muslins and silks. The French system of weights and measures and French money are generally used. The chief towns are Algiers, Oran, Constantine, Bona and Tlemcen. The highways are in charge of the government and are kept in excellent condition. There are also about 1300 miles of railway in the country, besides telegraph lines connecting all the principal points.

The native inhabitants include Arabs and Berbers. The Arabs are wanderers, dwelling in tents and frequently moving from place to place. They have occupied the country since the twelfth century. The Berbers are the original inhabitants of the territory and form a considerable part of the population. They speak the Berber language but use Arabic characters in writing. The Jews form a small part of the population, and there are some over 260,000 colonists of French origin and over 200,000 who are natives of other European countries, chiefly Spain and Italy. The colony is governed by a governor general, assisted by a council appointed by the French government.

HISTORY. Algeria was known to the Romans as Numidia, and under their rule was very prosperous. It was conquered by the Vandals in 430 A. D. and was recovered by the Byzantine Empire about a century later. About the middle of the seventh century it was overrun by the Saracens. Moors and Jews who were driven out of Spain by Ferdinand and Isabella at the end of the fifteenth century settled in Algeria, but the country was soon made tributary to Spain. Later it came under the protection of Turkey, and for some centuries was noted for the system of piracy practiced by its inhabitants. This was suppressed when the country came under French rule in 1830. Population in 1901, 4,774,042.

Algiers, *al jeerz'*, a city and seaport on the Mediterranean, capital of the French colony of Algeria, on the Bay of Algiers, partly on the slope of a hill facing the sea. The old town, which is the higher, is oriental in appearance, with narrow, crooked streets, and houses that are strong, prison-like edifices. The modern French town, which occupies the lower slope and spreads along the shore, is handsomely built, with broad streets and elegant squares. There is a large shipping trade carried on, chiefly with France, but also with England, Spain and Italy. The climate of Algiers, though extremely variable, makes it a very desirable winter residence for invalids and tourists. Population, 96,784.

Algo'a Bay, a bay situated on the south coast of Cape Colony, 425 mi. n. e. of the Cape of Good Hope. It has an excellent harbor and is the only place of shelter for vessels during the northwest gales. The usual anchorage is off Port Elizabeth, on its west coast. Owing to the advantages of the harbor, this town has become one of the most important commercial points of South Africa.

Al'gol, a remarkable star situated in the constellation of Perseus. For more than one hundred years it was recognized as variable, growing brighter at certain regular intervals, then fading away. For a long time this phenomenon puzzled the astronomers exceedingly, but it has now been proved that most of the conditions may be accounted for by the presence of a satellite revolving about Algol. Measurements show that Algol is something over 1,000,000 miles in diameter, and its satellite about 830,000 miles.

Algon'kian System, the name given in the United States to a great system of rocks between the Archaean below and the Cambrian above. All the formations are metamorphic or sedimentary, and are elastic and highly crystalline. They comprise granites, marbles, schists, slates, quartzites and conglomerates. The rocks contain but few fossils, and these are indistinct. The system is remarkably well developed around Lake Superior, where, in addition to the classes of rocks named, are found dikes and beds of igneous rock, also the great deposits of iron and copper which are among the richest in the world. See ARCHAEAN SYSTEM; CAMBRIAN SYSTEM; also GEOLOGY; PALEOZOIC ERA; ROCKS.

Algon'quian Indians, the largest and most widely scattered group of tribes in North America. They inhabited the land from Labrador southwest to the Carolinas and Tennessee, and west to the Rocky Mountains, surrounding the Iroquoian and bordering on the Siouan to the west and south, and the Athapascan tribes to the northwest. Two-thirds of the entire 1000 now living are in Canada. They were fierce people, these Algonquians, and wherever they met the European colonists long and bloody wars followed until the natives were driven across the Alleghanies. Throughout the French and Indian wars they sided with the French and stubbornly fought against the English, but in the end, as was the case with more peaceful tribes, they found themselves confined to scattered reservations west of the Mississippi. The Canadian Algonquian were better treated, and now live not far from their original homes.

Corn was a great staple among the Algonquian, who cultivated the soil about their permanent homes of bark and logs. Among the chief tribes of this family are the Narragansett, Pequot, Delaware, Ottawa, Ojibwa, Miami, Illinois, Kickapoo, Pottawatomi, Arapahoe and Cheyenne, and to each of these is given a brief article in this work.

Alham'bra (the Red Castle), the citadel and palace of the Moorish kings of Granada, standing on a hill surrounded by a wall flanked by many towers, and having a circuit of two and a quarter miles. It was begun about 1248 and was captured by Ferdinand and Isabella in 1492, when the Moors were driven from Spain. Charles V and Philip V later mutilated it, and though it has suffered much from fire and time it still remains the finest example of Moorish art in Spain. Artists and architects of later times have copied from the palace, and Washington Irving has written its most interesting legends in *The Alhambra*.

Ali, *ah'le,* (about 600–661), cousin and son-in-law of Mohammed, the first of his converts and the bravest and most faithful of his adherents. It was not until after the murder of Othman, the third caliph, that Ali came to power as caliph. His followers were known as Shiites, as opposed to Sunnites.

A'lias, in law, a term used to denote the different names assumed by a person in order to conceal his true name. The term can be applied only when a person is known to have acted under the various names. The same name is given to a writ issued after one of the same kind has been issued and for the same purpose. See WRIT.

Alicante, *ah le kahn'te,* an important town of the province of Alicante in Spain. Its former name was Lucentum, and it was an important town of the Romans. In 713 it was captured by the Moors, and Ferdinand III of Castile retook it. It is situated on the Mediterranean and possesses a very fine harbor, making it one of the finest seaports of Spain. The trade is considerable, wine, fruit, oil, silk and grain being among the exports. There are three churches, two nunneries, a library and a picture gallery. Population in 1900, 50,495.

Alien, *ayl'yen,* in relation to any country, a person born out of its jurisdiction and not having acquired the full rights of its citizenship. The position of aliens differs in different countries, but, generally speaking, they owe a local allegiance and are bound equally with natives to obey all general rules for the preservation of order. In the United States aliens may acquire and hold real property without restriction, except in some states. Personal property they can take, hold and dispose of like native citizens. Individual states have no jurisdiction on the subject of naturalization, though they may pass laws admitting aliens to any privilege short of citizenship. Five years' residence in the United States and one year's residence in the state where the application is made are necessary for the attainment of citizenship in the United States. See NATURALIZATION.

Alien and Sedition Laws, a series of laws enacted in 1798 by the United States Congress, during the presidency of John Adams. The alien law gave the president power to order aliens out of the country upon suspicion of political activity or for other reasons. The sedition law imposed a fine and imprisonment on those who conspired to resist government measures or who published libelous or scandalous statements concerning Congress or the president. The chief occasion of these laws was the activity in opposition to the administration of those who sympathized with French interference in American affairs. The passage of the laws aroused such intense opposition that the Federalists were soon driven from office and never again gained control of the government.

Alimen′tary Canal, a common name given to that portion of the digestive apparatus which begins at the mouth and includes the pharynx, oesophagus, stomach and intestines. Its length is about thirty feet in an adult, or five or six times the height of the individual. It is lined throughout with a mucous membrane which in different parts gives off the secretion peculiar to each. Its muscular coat has the power to force food along. See INTESTINES; STOMACH.

Al′imony. See DIVORCE.

Aliz′arin, a substance contained in the madder root, and used in dyeing reds of various shades. Formerly madder root was employed as a dye-stuff, but now the use of the root has been almost superseded by the employment of alizarin itself, prepared artificially from one of the constituents of coal-tar.

Al′kali, a term first used to designate the soluble part of the ashes of plants, especially seaweed. Now the term is applied to various classes of bodies having the following properties in common: (1) solubility in water; (2) the power of destroying the property of acids, and forming salts with them; (3) the property of corroding animal and vegetable substances; (4) the property of changing the tint of many coloring matters—thus, they turn litmus, reddened by an acid, into blue; turmeric, brown; and syrup of violets or an infusion of red cabbages, green. The alkalies are hydrates, or water in which half the hydrogen is replaced by a metal or substance acting like a metal. In its restricted and common sense the term alkali is applied to four substances only: hydrate of potassium (potash), hydrate of sodium (soda), hydrate of lithium (lithia) and hydrate of ammonium (an aqueous solution of ammonia). In a more general sense it is applied to the hydrates of the so-called *alkaline earths* (baryta, strontia and lime) and to a large number of organic substances, both natural and artificial, described under ALKALOID. *Volatile alkali* is a name for ammonia.

Al′kaloid, a term applied to a class of compounds having some of the properties of bases (See BASE) and found in living plants usually combined with something else. Their names generally end in *ine,* as *morphine, quinine, caffeine,* etc. Most alkaloids occur in plants, but some are formed by decay of animal matter; and there is also a class of artificial alkaloids produced from coal-tar products. Most natural alkaloids contain carbon, hydrogen, nitrogen and oxygen. Those containing oxygen are solids, those without oxygen are liquids. Among the alkaloids are the strongest poisons and the most powerful remedies known to man.

Al′kanet, the bark of the root of a plant with downy and spear-shaped leaves and clusters of small purple or reddish flowers. The plant is sometimes cultivated in Great Britain, but most of the alkanet of commerce is imported from the Levant or from southern France. It imparts a fine deep-red color and is used for coloring oils, plasters, lip-salve and confections.

Al′lah, in Arabic, the name of God, a word of kindred origin with the Hebrew word Elohim. Allah Akbar (God is great) is a Mohammedan war-cry.

Allahabad, *ahl′lah hah bahd′* ("City of God"), an ancient city of India, capital of the Northwest Provinces. Allahabad is one of the chief resorts of Hindu pilgrims, who come to have their sins washed away by bathing in the waters of the sacred rivers Ganges and Jumna at their junction. It is also the scene of a great fair in December and January. The town is poorly built, but contains some remarkable buildings, of which the best examples are the great mosque, or Jumma Musjid, the palace of the sultan and the great citadel of Akbar. This citadel is the center of the fort of Allahabad, one of the chief strongholds of British India. The city is situated in the midst of an agricultural district and forms the center of a large trade, the chief products being cotton, indigo and sugar. The town is as old as the third century B. C. From 1765 to the beginning of the nineteenth century it suffered from change of rulers, but finally came under British rule. In the mutiny of 1857 it was the scene of a serious outbreak and massacre. Population in 1901, 175,750.

Al′lan, SIR HUGH (1810–1882), a Canadian financier and ship-owner, born in Scotland. In 1824 he came to Canada and after some hardship established the Allan line of ocean steamers. He was a director of several banks, was one of the projectors of the Canadian Pacific railway and was knighted in 1871 for his service in upbuilding the commercial interests of Canada.

Alleghany, *al′le ga′ny,* **Mountains,** a name sometimes used as synonymous with Appalachians, but also often restricted to the portion of those mountains that traverses the states of Virginia, Maryland and Pennsylvania from southwest to northeast, and consists of a series of parallel ridges for the most part wooded to the summit and with some fertile valleys between. Their mean elevation is about 2500 feet; but in Virginia they rise to over 4000. See Blue Ridge; Cumberland Mountains.

Alleghany Springs, a popular health resort in Montgomery co., Va., 3 mi. s. of Shawsville. It is noted for its medicinal springs and for the mineral springs in the close neighborhood.

Allegheny, *al le ga′ny,* a city in Allegheny co., Pa., on the Allegheny River, opposite Pittsburg, with which it is connected by several handsome bridges. Allegheny is the terminus of the Western Pennsylvania, the Pittsburg & Western and the Pacific, Rochester & Pittsburg, and is on the Pittsburg, Fort Wayne & Chicago, the Cleveland & Pittsburg and several other railroads. Allegheny and Pittsburg form one industrial and social community. The city's manufacturing interests are large. Important among these are iron and steel rolling mills, car and locomotive works and manufactures of textiles, flour, salt, sanitary plumbing supplies, white lead, leather, stoves, pickles and preserves. The finest public buildings are the city hall and the Carnegie Free Library. In the center of the city is a public park of 100 acres, containing pretty lakelets and fountains and a monument to Humboldt. The fine Library Monument, in memory of the soldiers from Allegheny county who perished in the Civil War, stands on a lofty crest overlooking the river. Among important educational institutions are the Western Theological Seminary, the United Presbyterian Theological Seminary, the Allegheny Theological Institute and the Western University of Pennsylvania. The town was laid out in 1785. In 1906 Allegheny was united with the city of Pittsburg. See Pittsburg.

Allegheny, a river rising in Pennsylvania and flowing into New York, then back into Pennsylvania, uniting with the Monongahela at Pittsburg to form the Ohio. It is 325 miles long and is navigable for 200 miles above Pittsburg.

Al′lego′ry. An allegory is a story told not for its own sake but for the purpose of presenting in a clear and interesting manner some abstract thought. To be complete, each character in the narrative should represent some quality, and the relation of the characters and the outcome of the narrative show the interaction of various qualities on one another. The most famous of English allegories is Bunyan's *Pilgrim's Progress.* Tennyson's *Idylls of the King* is one of the best of many allegories which are not wholly symbolic.

Al′len, Ethan (1737–1789), an American soldier, was born in Litchfield, Conn., but about 1763 settled near Bennington, Vt. In 1764 the king decided in favor of the claim of New York to jurisdiction over the Green Mountain territory against the settlers of Vermont, and Allen was chosen to plead the cause of the settlers at Albany. The courts decided adversely, but Allen organized a band of troops known as the Green Mountain Boys, who, with the New Hampshire grantees, expelled the New York settlers. Governor Tryon of New York offered $750 reward for Allen. In 1775, after the Battle of Lexington, the condition of Fort Ticonderoga attracted the attention of the patriots, and Allen and Benedict Arnold both were eager to effect its capture. The Green Mountain Boys, with Allen, reached Lake George before Arnold overtook them, and on May 10, 1775, when but a part of his men had as yet crossed the lake, Allen rushed into the fort and ordered the commander to surrender "in the name of the Great Jehovah and the Continental Congress!"

After this Allen went to Philadelphia, where he received the thanks of Congress for his services. He was sent on a secret mission to Canada to learn the views of the Canadians as to rebellion, and accompanied Montgomery's expedition. In an adventure at Montreal he was captured and sent to England, but was returned to this country, where he was confined in prison-ships. On obtaining his freedom Allen was appointed lieutenant colonel of the Vermont militia and was sent as an agent to Congress to secure the admission of Vermont to the Confederation. Congress hesitated, and the British commanders endeavored to persuade Allen to restore the authority of the crown. He was accused of treason, but it is believed that his relations with the British were all entered into for the sake of advancing the cause of the colonies. After the Revolution Allen lived in retirement and wrote a book on natural religion, entitled *Reason the Only Oracle of Man.*

Allen, James Lane (1849–   ), an American novelist, born near Lexington, Ky. He graduated at Transylvania University and after teaching at Kentucky University, became a professor of Latin and higher English at Bethany College, W. Va. After 1886 he lived in New York and wrote much fiction. His works show artistic finish and knowledge of human nature. Among them are *The Choir Invisible*, *The Reign of Law* and *The Mettle of the Pasture*. Among his best short stories are *The White Cowl* and *Sister Dolorosa.*

JAMES LANE ALLEN

Allen, WILLIAM (1784–1868), an American clergyman and author. He became president of Dartmouth College in 1817, and was president of Bowdoin College from 1820 to 1839. His most important work was the *American Biographical and Historical Dictionary.*

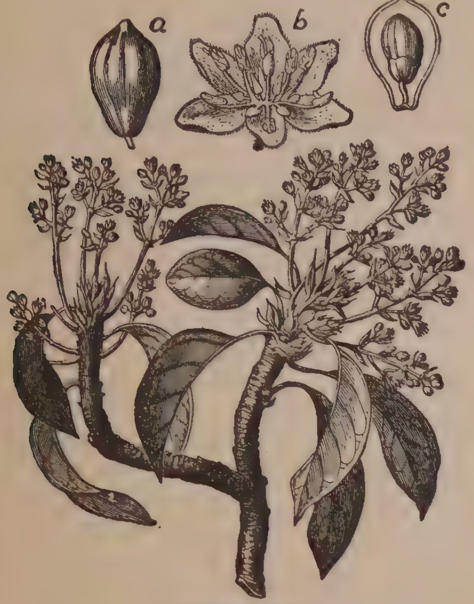
Al′lentown, PA., the county-seat of Lehigh co., 60 mi. n. w. of Philadelphia, on the Lehigh River and on the Philadelphia & Reading and other railroads. The city is on high ground in a fertile region and has extensive iron and steel works. It is second only to Paterson, N. J., in the production of American silks and ranks about first among the cities of the United States in the manufacture of furniture. Other products include cement, cigars and thread. The population is mostly of German descent. The city has a fine hospital, is the seat of Muhlenberg College (Lutheran) and of the Allentown College for Women. The place was laid out as Allentown about 1752 by William Allen, then the chief justice of Pennsylvania. In 1811 it was incorporated as the borough of Northampton, but the original name was restored in 1838. The city owns and operates the waterworks. Population in 1910, 51,913.

Alli′ance, O., a city in Stark co., 57 mi. s. e. of Cleveland, on the Mahoning River and on the Pennsylvania and other railroads. It is in an agricultural region and has extensive manufactures, including structural iron, steam hammers, boilers, agricultural implements, terra cotta ware and white lead. Mount Union College (Methodist Episcopal) is located here. The city owns and operates its waterworks. The place was settled in 1838 and was called Freedom till 1850. Population in 1910, 15,083.

Al′libone, SAMUEL AUSTIN (1816–1889), an American author. He compiled a most useful *Critical Dictionary of English Literature and British and American Authors* and volumes of prose and poetical quotations.

Al′liga′tor, a large reptile resembling the crocodile, dwelling in waters of tropical regions of the western hemisphere, where it frequents swamps and marshes and may be seen during the day basking on the dry ground in the heat of the sun. Alligators were formerly common along the southern shores of the United States and far up the Mississippi River. They are slow in growth and when fifteen years of age are not more than two feet long. Nearly a hundred years are required for them to reach their full length of sixteen feet. They are active animals and prey upon whatever game comes their way. Whenever they have captured an animal, they take it into the water and eat below the surface. They are rather timid, in spite of their size, but defend themselves viciously if attacked; on shore they rush with open mouth at their enemies and thrash their powerful tails from side to side. The young are hatched by the sun from eggs, of which the female lays 200 or more in great heaps of vegetable matter. The alligators of South America were very often called *caymans.* One species is known as the *spectacled cayman,* because of the high bony rim surrounding the orbit of each eye. In the United States the alligator is not often seen north of Florida, but at one time it was not uncommon from North Carolina to the Gulf of Mexico and west to Mexico. Millions have been killed for sport and because of their hide and ivory. The flesh of the alligator is often eaten.

Alligator Pear, the fruit of an evergreen tree. It resembles a large pear, one to two pounds in weight, with a firm marrow-like pulp of a delicate flavor. It is called also avocado pear or vegetable butter. It is a native of tropical America and the West Indies and is cultivated in Florida and Southern California.



ALLIGATOR PEAR
a, fruit; *b*, flower; *c*, longitudinal section of fruit.

Al'lison, William Boyd (1829–1908), an American statesman, born at Perry, Ohio. He was educated at Allegheny College, Pa., and Western Reserve College, Ohio, and practiced law in Ohio until 1857, when he removed to Dubuque, Iowa. He served in Congress as a Republican from 1863 to 1871, and in 1873 was elected to the United States Senate, being five times reëlected. He was joint author of the Bland-Allison bill of 1878, for the purchase of silver bullion and the coinage of a certain number of silver dollars each month, and took a prominent part in the discussion and amendment of the so-called railroad rate bill in 1906. He was several times a prominent candidate for the Republican nomination to the presidency, and was always one of the party's influential leaders.

Allit'era'tion, the repetition of the same letter or sound at the beginning of two or more words immediately succeeding each other, or at short intervals, as *m*any *m*en of *m*any *m*inds; *d*eath *d*efies the *d*octor; "*p*uffs, *p*owders, *p*atches, *b*ibles, *b*illet-doux." In the ancient German and Scandinavian and in early English poetry, alliteration took the place of terminal rhymes, the alliterative syllables being made to recur with a certain regularity in the same position in successive verses. The following illustration is from the Anglo-Saxon poem, *Beówulf: "Flota* *fâm*ig-heals, *fug*le gelîcost." (The *float*er *foamy*-necked, to a *fowl* most like.)

Allo'dium. See Feudal System.

Allop'athy, the name applied by homeopathists to systems of medicine other than their own. Hahnemann's principle being that "like cures like," he called his own system *homeopathy*, and other systems *allopathy*. See Homeopathy.

Allot'ropy. Under special conditions many of the chemical elements have such totally different habits and properties that they appear to be entirely different substances. Thus, for instance, sulphur as usually seen is a light yellow, opaque, solid substance that breaks easily and is readily dissolved by carbon disulphide. Under other conditions it appears to be an entirely different thing—a translucent, amber-colored substance, soft and elastic like india rubber and insoluble in carbon disulphide. It is, however, still sulphur, and nothing else. Again, phosphorus under some conditions is a dark reddish-brown powder resembling chocolate, and non-poisonous; under others, it is colorless, translucent and wax-like, melting and even taking fire at a very low temperature, and is extremely poisonous. Yet in both conditions phosphorus is phosphorus. This property of appearing in

WILLIAM BOYD ALLISON

different forms is known in chemistry as allotropy, and one form is said to be an allotropic modification of the other. It is really a special case of polymerism. See POLYMERISM.

Alloy′, sometimes a chemical compound, but more generally merely a mechanical mixture produced by melting together two or more metals. Most metals mix together in all proportions, but others unite only in definite proportions, and form true chemical compounds. Others again resist combination and when fused together form not a homogeneous mixture but a conglomerate of distinct masses. The changes produced in their physical properties by the combination of metals are various. Their hardness is in general increased, their malleability and ductility impaired. The color of an alloy may be scarcely different from that of one of its components, or it may show traces of neither of the two. Its specific gravity is sometimes less than the mean of that of its component metals. Alloys are always more fusible than the metal most difficult to melt that enters into their composition, and generally even more so than the most easily melted one. Newton's fusible metal, composed of three parts of tin, two or five parts of lead and five or eight parts of bismuth, melts at temperatures varying from 198° to 210° F. and therefore in boiling water; its components fuse respectively at the temperatures 442°, 600° and 478° F. In some alloys, however, each metal retains its own fusing point. With a few exceptions metals are not used in a pure state. Printers' types are made from an alloy of lead and antimony; brass and a numerous list of other alloys are formed from copper and zinc; bronze from copper and tin.

All-Saints' Day, a festival of the Christian Church, instituted in 835, and celebrated on November 1. It owes its origin to the fact that it was impossible to set aside a separate day for every saint. See HALLOW-EVEN.

All-Souls' Day, a festival of the Catholic Church, instituted in 998 and observed on November 2. Its object is the relief, by prayers and acts of charity, of the souls in purgatory.

All′spice is the dried berry of the pimento, a West Indian species of myrtle, a beautiful tree with white and fragrant aromatic flowers and shiny leaves of a deep green. The name comes from the fact that allspice is thought to resemble in flavor a mixture of cinnamon, nutmegs and cloves. The fruit is also called Jamaica pepper. It is employed in cooking, also in medicine as an agreeable aromatic, and it forms the basis of a distilled water, a spirit and an essential oil.

All′ston, WASHINGTON (1779–1843), an American painter, born at Waccamaw, S. C. After graduating from Harvard in 1800, Allston went to Charleston and here began active work in art. The next year he went abroad and visited London, Paris and Rome, where he spent his time studying the works of the great masters. In style he imitated the Venetian School and has been called the "American Titian." His more important works are *The Dead Man Revived*, *Uriel in the Sun*, *The Prophet Jeremiah* and *Belshazzar's Feast*.

Allu′vium, deposits of soil, collected by the action of water, such as are found in valleys and plains, consisting of loam, clay and gravel, washed down from the higher grounds. Alluvium deposits are found along the banks of nearly all streams of considerable size, and they constitute the deltas formed by the Nile, the Po, the Mississippi and other large rivers. The large tracts of fertile land found along the lower courses of these and other rivers are also formed by alluvial deposits, as are most flood plains. See DELTA; FLOOD PLAIN; RIVER.

Al′macan′tar or **Almucantar,** an instrument consisting of a telescope floating in a basin of mercury. This arrangement gives a perfectly horizontal position to the telescope, through which a horizontal circle of the heavens parallel to the horizon can be viewed. It has been of considerable importance in astronomical observations.

Almagro, *al mah′gro,* DIEGO DE (1475–1538), a Spanish adventurer and navigator who came to America in 1514 and thereafter took a conspicuous part in the Spanish conquests in Central and South America, being a leader in Pizarro's expedition to Peru. Later, in conflict with Pizarro, Almagro was captured and executed.

Al′manac, a book or table in which are given a calendar, the time of the rising and setting of the sun, the phases of the moon, the most remarkable positions and phenomena of the heavenly bodies, for every month and day of the year; also the several fasts and feasts to be observed in the church and state, the terms of courts and often much miscellaneous information likely to be useful to the public. In England almanacs have been known from the fourteenth century, and there are several English almanacs of that century existing in manuscript form.

They became generally used in Europe within a short time after the invention of printing.

Formerly the immense popularity of almanacs was due to the mass of astrological predictions with which they were filled, and the effect of these guesses at the future was often so bad that in France it was necessary to prohibit, at various times, the publication of prophetic almanacs. The most famous English almanac was *Poor Robin's Almanack,* which was published from 1663 to 1775, and which was an incredible mixture of ignorance and imposture. In 1828 the Society for the Diffusion of Useful Knowledge, by publishing the *British Almanac,* took the lead in the production of an almanac containing genuine information, and by contrast showed the fraudulent nature of the information which had been furnished in the earlier almanacs. Even to the present day there are published in Great Britain almanacs containing astrological predictions, but they are not taken seriously, even by the ignorant classes.

The most famous of the popular almanacs which have been published in the United States was *Poor Richard's Almanac,* begun by Franklin in 1732 and continued for twenty-five years. Now the publication of good almanacs is in America confined almost entirely to large newspaper houses.

The *Nautical Almanac and American Ephemeris,* published annually by the United States bureau of navigation, embraces all the elements necessary for determining at any time the absolute and relative places of the sun, moon and seven principal planets and of many of the fixed stars, also several different series of phenomena for the determination of longitudes and latitudes, the distances of the moon from fixed stars and from planets and the time for the occurrence of eclipses. To these are added rules and tables for practical use in nautical astronomy, land observations and tables of tides. It is a text-book for the navigator, and no sailor leaves the American shore without it. The computations are made three years in advance and could be made still farther if necessary, but no cruise is made which lasts longer than that time. Similar publications are issued by the German, French and English nations.

Almandine, *al'man din,* the name given to two precious stones. One, red in color and transparent, is a variety of garnet and is found chiefly in Alabanda, Caria; hence its name. The other is a variety of Spinel ruby and is violet in color. Both varieties are beautiful gems for setting.

Alma-Tadema, *ahl'ma tahd'e ma,* LAWRENCE (1836–), a Dutch painter, born in Friesland, but long a resident of England. In 1879 he became a Royal academician and was later made a member of various foreign academies. He is especially celebrated for his pictures of ancient Roman, Greek and Egyptian life, which are painted with great realism and archaeological correctness. Some of his best known pictures are *Reading from Homer, At the Shrine of Venus, The Four Seasons* and *Antony and Cleopatra.*

Almeria, *ahl ma re'ah,* a fortified seaport of southern Spain, 60 mi. s. e. of Granada. The important buildings are the Gothic cathedral and the Church of San Pedro. The leading manufactures include sugar, macaroni and white lead. The city has an important trade in fruit, grapes, almonds, pomegranates and iron ore, all of which are shipped from its port. The climate is very healthful and the city is a favorite resort for invalids. Population in 1900, 47,202.

Almond, *ah'mund,* the fruit of the almond, a tree which grows usually to the height of twenty feet, and is akin to the peach and nectarine. It has beautiful pinkish flowers that appear before the leaves, which are oval, pointed and delicately serrated. The almond is a native of Africa and Asia, now naturalized in southern Europe, and cultivated in England for its

ALMOND
Branch, blossom and fruit.

beauty and in California for its fruit. The fruit has a downy outer coat which covers the flattish, wrinkled stone that encloses the seed. There are two varieties, one sweet and the other bitter. Sweet almonds are a delicious food and furnish an oil used in flavoring. Bitter almonds contain prussic acid, a highly poisonous substance.

Aloe, *al'o,* the name of a genus of plants some of which are not more than a few inches, while others are thirty feet and upward, in height. They are natives of Africa and other hot regions, have leaves fleshy, thick and more or less armed with spines at the edges or ends, and have flowers with a tubular corolla. The fibrous parts of the leaves of some species are made into such things as cordage, fishing nets, lines and cloth; the juice of several species is used in medicine as a bitter drug, under the name of *aloes.* The principal drug-producing species are the Socotrine aloe, the Barbadoes aloe and the Cape aloe. A beautiful violet color is afforded by the leaves of the Socotrine aloe. The so-called American aloe is a different plant altogether (See AGAVE), as are also the aloes or lign-aloes of Scripture.

ALOE

Aloes Wood, *al'oze wood,* or **Eagle Wood,** the inner portion of the trunk of forest trees found in tropical Asia and yielding a fragrant resinous substance, which, as well as the wood, is burned for its perfume. It is hard and fine-grained, takes a high polish and is highly prized for ornamental work. Another tree also produces aloes-wood. This wood is supposed to be the lign-aloes of the Bible, and Herodotus says that it was sold for its weight in gold.

Alpac'a, a cud-chewing animal of the camel tribe, a native of the Andes, especially of the mountains of Chile and Peru, and so closely allied to the llama that by some it is regarded rather as a smaller variety than a distinct species. It has been domesticated, and remains also in a wild state. In form and size the alpaca approaches the sheep, but it has a longer neck. It is valued chiefly for its long, soft and silky wool, which is straighter than that of the sheep, and very strong. The wool is woven into fabrics of great beauty. All of these are known as *alpaca,* and they are used for shawls, clothing for warm climates, coat-linings and umbrellas. The flesh of the aplaca is pleasant to eat and is wholesome.

ALPACA

Alpe'na, MICH., the county-seat of Alpena co., 110 mi. n. of Bay City, on Thunder Bay and on the Detroit & Mackinaw railroad. The city has extensive fisheries, and there are foundries, saw mills, planing mills and cement works. Lumber is the chief export. Alpena has a good high school, a public library and several parks. It was settled in 1835 and incorporated in 1871. Population in 1910, 12,706.

Alpha, *al'fah,* **and Ome'ga,** the first and last letters of the Greek alphabet, sometimes used to signify completeness. They are also used as a symbol of God. They were formerly the emblem of Christianity and were engraved on the tombs of the early Christians.

Alphabet, *al'fa bet,* (from *Alpha* and *Beta,* the first two letters of the Greek alphabet), the series of characters used in writing a language, and intended to represent the sounds of which it consists. The English alphabet, like all those of modern Europe except the Russian, is derived directly from the Latin, the Latin from the ancient Greek and that from the Phoenician, which again is believed to have had its origin in the Egyptian hieroglyphics. The Hebrew alphabet probably had practically the same origin, and the names of the letters in Phoenician and Hebrew must have been almost the same, for the Greek names, which, with the letters, were borrowed from the former, differ little from the Hebrew.

By means of the names we may trace the process by which the Egyptian characters were transformed into letters by the Phoenicians. An Egyptian character, for example, recalled by its form the idea of a house, in Phoenician or Hebrew, *beth,* and the character itself was given the name *beth.* This character would subsequently come to be used wherever the sound *b* occurred. Its form was afterward simplified and modified, but the name still remains, *beth* being still the Hebrew name for *b,* and *beta* the Greek. Our letter *m,* which in Hebrew was called *mim,* water, has still a resemblance to the zigzag, wavy line which by the Egyptians was used to represent water. The letter *o,* of which the Hebrew name means *eye,* was no doubt originally intended to represent that organ.

The Greek alphabet originally possessed only sixteen letters, though the Phoenician had twenty-two; the original Latin, as it is found in the oldest inscriptions, consisted of twenty-one letters, and the German has the same letters as the English, although the sounds of some of them are different. The Sanskrit alphabet is one of the most remarkable in the world. As now used it has fourteen characters for the vowels and diphthongs and thirty-three for the consonants, besides two other symbols. Our alphabet is an imperfect instrument, since, in the first place, it has not a character for every sound, and, in the second place, it has letters which are superfluous, because there are other letters which represent the same sounds. Thus *a* may stand for any one of eight sounds, while *c* is unnecessary because its two sounds are represented by *k* and *s.* An alphabet is not essential to the writing of a language, since symbols may be used instead, as in Chinese.

There is a remarkable Indian alphabet which was invented by Seequoyah of the Cherokee tribe. In his first attempts at alphabet-making he tried to represent the sounds of the Cherokee language by pictorial signs, using images of birds and beasts, but he soon gave this up and used instead such arbitrary signs as he thought would be most easily remembered. At first he used over 200 characters, but these were later reduced to 86. The United States government became interested in his discovery, had a font of type cut for his alphabet, and a newspaper, *The Cherokee Phoenix,* was printed partly in Cherokee and partly in English.

Alphon'so XIII. See ALFONSO XIII.

Alps, the highest and most extensive mountain chain in Europe, forming the water-shed between the river systems of the Mediterranean Sea and the Atlantic Ocean. It covers parts of five countries: portions of northern Italy, southeastern France, southern Germany, western Austria-Hungary and most of Switzerland. Several important rivers of Europe take their rise in the Alpine valleys, the largest being the Rhine and the Rhone. The range is about 660 miles long and from 90 to 180 miles wide. Its average height is about 7700 feet, the highest peaks being Mont Blanc, 15,781 feet, on the Franco-Italian border, and Monte Rosa, 15,217, in Switzerland. The system of ranges is now commonly grouped under Eastern, Western and Central Alps. The general form of the Alps is that of a crescent; from the principal chains spurs extend to the Apennines, the Vosges, the Harz, the Balkans and the Carpathians. The higher Alps are covered with perpetual snow and from the peaks there descend to the valleys below great glaciers, enormous masses of partially melted snow and pulverized ice, constantly augmented by the masses from behind, which acquire a moving force that nothing can resist. Finally they reach a point where the sun melts them, and they become the sources of mountain rivers. The largest glacier is the *Mer de Glace,* on the northern slope of Mont Blanc, and is 15 miles long, 3 to 6 miles wide and 80 to 120 feet thick. The Rhône Glacier is one of the most famous. The Helvetian Alps in western Switzerland, on both sides of the Rhone, are the portion most visited and afford the most beautiful mountain scenery of Europe. Among their peaks are the Jungfrau and the Finsteraarhorn. The dangerous ascent of Mont Blanc was first made in 1786 by a Frenchman, Jacques Balmat. The Alps were formerly considered well-nigh impassable, and many perished in the attempt. Hannibal's famous passage was reckoned one of his greatest feats. There are now good roads over most of the passes, some of which, however, are exceedingly dangerous. The chief passes connect Switzerland and France with Italy One of the first famous roads was that built by Napoleon, 1803–1810, over Mont Cenis, at a height of 6773 feet. The Mont Cenis tunnel, connecting France and Italy, is 14 miles from this road (See MONT CENIS TUNNEL). It was built 1861–1870 and is 7¾ miles long. The celebrated Saint Gothard pass is 6935 feet high, and has been crossed by a carriage road since 1823. The great tunnel of Saint Gothard, connecting Luzerne and Milan, is near this pass (See SAINT GOTHARD TUNNEL). Other famous passes are the Col de Balme, celebrated for its view of Mont Blanc, the Little Saint Bernard, one of the oldest and easiest, and the Great Saint Bernard, famed for its inn and dogs. Owing to the great height of the Alps, their vegetation is remarkably varied. At 6500 feet all the vegetation of the plains has disappeared, including maize, cereals, common fruit, and forest trees. Between 7500 and 8500 feet a very rich pasturage and the peculiar Alpine flora appear. Animal life in many forms is abundant, and peculiar to Alpine regions are the chamois and the mountain goat. See MONT BLANC; JUNGFRAU; ROSA, MONT; MATTERHORN.

Alsace-Lorraine, *al sas' lor rayn'*, an imperial territory of the German Empire, lying e. of France and n. of Switzerland. Its length from north to south is 123 miles; its width varies from 22 to 105 miles, and its area is 5580 square miles, or about one-eighth more than that of the State of Connecticut.

The eastern portion is a plain sloping toward the Rhine and containing occasional marshes and swamps, while the western portion is traversed by the Vosges Mountains, which rise in places to a height of 4700 feet. The mountains contain valuable depositis of iron and coal, and Alsace-Lorraine has become the leading iron producing country of the Empire. Fruit culture also is extensive in the mountain regions, and grapes are largely cultivated. In its manufacturing interests, also, Alsace-Lorraine is one of the most important territories of the Empire. The leading manufactures are cotton, woolen and silk goods and iron products, including pig iron, machinery and tools. While the manufacture of cloth is carried on in large factories in the cities, throughout the country much cloth is still woven in the homes and on hand looms. Good roads, numerous railways and canals and telegraph and telephone lines traverse the country, making transportation and communication convenient and cheap. The important towns are Strassburg, the capital, Metz, Mülhausen and Kolmar.

HISTORY. In the fourth and fifth centuries Alsace-Lorraine was brought under the control of the German tribes. Later it passed to the Franks, but was regained by the Germans in the tenth century. In the sixteenth century it again came under the control of the French, and at the peace of Westphalia, in 1648, the Hapsburgs ceded their territory in Alsace to France. Louis XIV seized the free cities Strassburg and Kolmar, and his right to them was confirmed by the Treaty of Ryswick in 1697. At the close of the Franco-German War in 1871 Germany demanded as a condition of peace that Alsace and about one-third of Lorraine be ceded back to her, and France was obliged to yield, although the inhabitants of the ceded territory were almost universally opposed to becoming German subjects. So strong was this opposition that for some time local government was almost at a standstill, as those who were elected to office refused to take the oath of allegiance to the German Empire. In 1872 the emperor compelled the inhabitants to declare themselves either French or German citizens, and of the 150,000 who declared for France about one-third removed to French territory. After this the bitter feeling existing against the German government began to subside, and the inhabitants generally accepted German rule, under which they have prospered and have been well governed. Population in 1900, 1,717,457.

Altai, *al'ti*, **Mountains,** THE, an important Asiatic system on the borders of Siberia and Mongolia, are partly in Russian and partly in Chinese territory, The highest summit, Byeluka or White Mountain, is 11,000 feet. Geologically the Altai are among the oldest mountains of Asia; their summits have been worn and rounded; their lower slopes are covered with grass and their higher slopes are clothed with forests which extend nearly to their summits.

The Altai are exceedingly rich in minerals, including gold, silver, copper and iron, and within the Russian provinces mining has become an important industry.

Altar, *awl'tur,* a place of worship where sacrifices are made, offerings laid or other religious rites performed. Altars date back to early history, the Babylonians, Egyptians and other people having used them commonly. The Greeks and Romans erected them to different gods. They were made of earth and stones at first and later of highly sculptured stone, developing into colossal monuments, of which an excellent example is the Altar of Peace, built in honor of Augustus at Rome, one of the masterpieces of art of the Augustan reign. Altars were made of various shapes, square, oblong and circular, and were used for incense, for flowers or the like, or for bloody sacrifices. The shape gradually was reduced to the uniform oblong and in the Christian churches only one altar was allowed in each church. Within the altar was a hollow chamber used for the relics of martyrs or saints, at first called the confession and later developed into the crypt (See Crypt). In some of the Lutheran churches the altar has been retained, but as a general rule it is not used in Prostestant churches to-day. The term altar in the Christian church to-day generally refers to the table-like structure at which communion is offered.

Altenburg, *ahl'ten boorg,* ("old castle"), a city of Germany and the capital of Saxe-Coburg-Gotha, is situated near the Pleisse River, 24 mi. s. of Leipsic. The most noted building is the ducal castle, which stands upon a high and nearly perpendicular cliff. The town contains a number of good educational institutions, a theater, a picture gallery and a museum. It also has a hospital for the poor. The manufactures include cigars, hats, gloves and brushes, and there is considerable trade, especially in woolen yarn. Population in 1900, 37,100.

Altgeld, *ahlt'geld,* John Peter (1847–1902), an American politician, born in Germany. He entered the Union army in 1863 and fought until the close of the war. Later he began the study of law and was admitted to the bar. He was at one time judge of the superior court in Chicago and from 1893 to 1897 was governor of the State of Illinois, gaining notoriety by his pardon of several of the anarchists connected with the Haymarket riots. He was active in support of Bryan in his two presidential campaigns and was a popular public speaker and the author of several books on social and political questions.

Al'to. See Music.

Alton, *awl'tun,* Ill., a city in Madison co., on the Mississippi River, 10 mi. above the mouth of the Missouri River, and on the Chicago & Alton, Chicago, Cincinnati, Cleveland & St. Louis and Chicago, Peoria & St. Louis railroads. The city is picturesquely located on limestone bluffs about 200 feet above the river. It has a large trade and extensive manufactures of glass, flour, machinery, tools and boxes. Important institutions are the Cathedral of Saints Peter and Paul, Saint Joseph's Hospital, Ursuline Convent, Jennie D. Hayner Memorial Library and an Old Ladies' Home. Upper Alton, 2 miles distant, is connected by an electric railway and is the seat of Shurtleff College and the Western Military Academy. Alton was settled in 1783 and was incorporated in 1835. The city contains a monument to Elijah P. Lovejoy, the abolitionist, who was killed during a riot, Nov. 7, 1837. Population in 1910, 17,528.

JOHN PETER ALTGELD

Altona, *ahl'to na,* an important commercial city in the Prussian province of Schleswig-Holstein, adjoining Hamburg, with which it virtually forms one city. It is a free port, and its commerce, both inland and foreign, is large, being identified with that of Hamburg. Population in 1900, 161,370.

Altoo'na, Pa., a city in Blair co., 117 mi. e. of Pittsburg, on the Pennsylvania and the Altoona, Clearfield & Northern railroads. The city is picturesquely located 1,180 feet above sea level, at the eastern base of the Alleghany Mountains. Extensive railroad shops of the Pennsylvania Company, employing some 7000 persons, are located here. Altoona contains a public library, hospital, two convents and Lakemont Park, while of special interest near the city is the famous Horseshoe Bend. Altoona was founded by the Pennsylvania Railroad Company in 1850 and has developed rapidly. Population in 1910, 52,127.

Altorf or **Altdorf,** *ahlt'orf,* a small town of Switzerland, capital of the canton of Uri, beautifully situated near the Lake of Lucerne, amid gardens and orchards, and memorable as the place where, according to legend, William Tell shot the apple from his son's head. A colossal statue of Tell now stands here. Population, about 3000.

Alto-Rilievo, *ahl'to re lya'vo,* (high relief), is the term applied to sculptured figures to express the fact that they stand out boldly from the background. A figure to be in high relief should actually stand out more than one-half its thickness from the background without being entirely detached. See Bas-Relief; Mezzo-Rilievo.

Al'um, as commonly used, is a compound of potassium, aluminum and sulphuric acid. It is called potash alum and is a clear, colorless solid which forms crystals. It dissolves in water, has a peculiar puckery taste and is used in dyeing and in hardening fats and tallow. When heated, it loses water and becomes a powder called *burnt alum.* There are other compounds similarly formed which contain such substances as ammonia sodium or iron in place of potash and are called *ammonium alum, sodium alum* or *iron alum.* These various alums have uses in arts and maunfactures.

Alu'mina, the single oxide of the metal aluminum, which, when combined with silica, is one of the most widely distributed substances. It enters in large quantity into the composition of granite, traps, slates, schists, clays, loams and other rocks. The porcelain clays and kaolins contain about half their weight of this earth, to which they owe their most valuable properties. It has a strong affinity for coloring matters, which causes it to be employed in the preparation of the colors called lakes, used in dyeing and calico printing. It combines with the acids and forms numerous salts, the most important of which are the sulphate and acetate, the latter of extensive use as a mordant. In its native state it is called corundum. When crystallized it appears as ruby or sapphire. See Emery; Corundum; Ruby; Sapphire; Topaz.

Alu'minum or **Al'umin'ium,** a bluish-white metal discovered in 1827, and next to silicon and oxygen the most widely distributed element in the earth's crust. Aluminum is a little more than two and one-half times heavier than water. It does not tarnish when exposed to the air, is very ductile and malleable and is the most sonorous of all metals. It is nowhere found native, but is the basis of clay, which is its oxide.

Because of the difficulty in separating aluminum from its compounds it is only recently that it has been obtained in such quantities as to bring it into practical use. It is now obtained from bauxite (See Bauxite) by subjecting this mineral to the heat of the electric arc. The operation is carried on in furnaces constructed specially for the purpose. The furnace is practically a huge crucible made of blocks of carbon. In the bottom of the crucible is a small tap-hole, where the melted aluminum may be drawn out. The positive electrode is constructed of heavy carbon plates so as to form a prism. This is attached to a chain and a derrick so it can be lowered into the crucible as fast as the end burns off. Before the process begins, pieces of copper are thrown into the crucible to form the negative electrode. The bauxite is shoveled in through openings made for the purpose. When the electric circuit is completed, a terrific heat is produced which causes the bauxite to give up its aluminum. This runs down to the bottom of the crucible and is drawn off through the tap-hole. The bauxite is fed into the crucible as fast as it is reduced, and the process continues until the carbon electrode has been entirely consumed. An ordinary furnace will produce about four hundred pounds in twenty-four hours. Aluminum smelters are located at Niagara Falls and at Pittsburg, Pa.

The uses of aluminum are rapidly increasing. It is a good conductor of electricity and because of its lightness takes the place of copper occasionally in the construction of electric lines. One of its most important uses is in the manufacture of steel, since the addition of a small quantity of aluminum greatly improves the quality of the steel. It is also used in the manufacture of numerous household utensils, for which it is especially suited, since it is light, durable and is not easily acted upon by acids. There are numerous alloys of aluminum and other metals, such as aluminum bronze, an alloy with copper, and magnalium, an alloy with magnesium.

Most of these alloys take a high polish and are valuable for ornamental work. Aluminum gold, which is a compound of aluminum and copper closely resembling gold, is often used in the manufacture of watch cases and cheap jewelry. While it is bright when new, it soon tarnishes and is almost worthless for the purposes for which it is used.

Alum Root, the name given in America to two plants on account of the remarkable astringency of their roots, which are used for medical purposes.

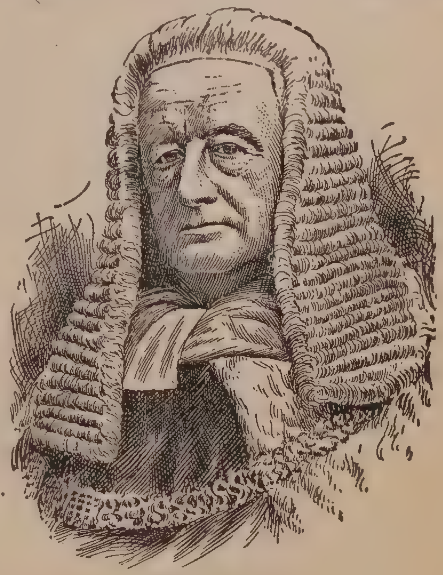
Alum Stone or **Alum Shale,** a mineral of a grayish or yellowish-white color, containing iron pyrite. On exposure to the air and rain the pyrite dissolves and the sulphur unites with the alumina in the rock, forming a compound from which alum is obtained. The process is hastened by roasting the rock and leaching it.

Alva, *ahl'vah,* or **Alba,** FERDINAND ALVAREZ DE TOLEDO, Duke of, (1508–1582), a Spanish statesman and general under Charles V and Philip II. He is remembered chiefly for his bloody and tyrannical government of the Netherlands, which had revolted, and which he was commissioned by Philip II to reduce to entire subjection. Among his first proceedings was the establishment of the "Council of Blood," a tribunal which condemned all whose opinions were suspected and whose riches were coveted. Many merchants and mechanics emigrated to England. The counts Egmont and Horn and other men of rank were executed, and William and Louis of Orange had to flee to Germany to save themselves. Resistance was quelled for a time, but the provinces of Holland and Zealand soon revolted against his tyranny. A fleet which was fitted out at his command was annihilated, and he was everywhere met with insuperable courage. He was recalled, and in 1573 he left the country in which, as he boasted, he had executed eighteen thousand men. He was received with distinction in Madrid. Before his death he reduced all Portugal to subjection to his sovereign.

Al'verstone, Lord (formerly Sir Richard Webster, 1842–   ), a distinguished English jurist. He was formerly attorney general of the United Kingdom and British counsel in the Venezuela dispute. He became chief justice in 1900. In 1903 Lord Alverstone was president of the Alaska boundary commission, and voted with the representatives of the United States, in opposition to the claims of Canada.

Am'adis of Gaul, the hero of a celebrated chivalry romance of the Middle Ages. The oldest extant version is one made about 1470, but for almost a century and a half before this time some form of the romance was current in Spain.

Amal'gam, an alloy or mixture of mercury and some other metal. The principal amalgams are with gold, silver, tin and copper. These alloys are most commonly formed by bringing mercury into contact with the other metal. In metallurgy mercury is used to extract free gold and silver from their ores because of its power of uniting with these metals. Tin amalgam is used for silvering mirrors. Copper amalgam has the power of softening when worked and becoming hard on standing; consequently it has been used for filling teeth.



LORD ALVERSTONE

Am'ana, a religious community founded in 1714 by Eberhard Gruber in Germany. The members of the community came to the United States, and after settling in New York in 1843, moved to Amana, Iowa, twelve years later. There are less than two thousand persons in the community, but they own 26,000 acres of land, much of it well improved. They live in families, but the community as a whole engages in manufactures, agriculture and other industries. Meals are provided by several families in common.

Am'aranth, the name of certain plants whose flowers are composed of dry scales that retain their color for a long time and are often called *everlastings.* Prince's feather and coxcomb belong to this family and are common in gardens. The *globe amaranth* is used in some countries for decorating Roman Catholic churches in winter. The amaranth is a symbol of immortality.

Am′aryl′lis Family, an order of plants, generally bulbous, with a highly colored flower, natives of Europe and most of the warmer parts of the world. The order includes the snowdrop, the snowflake, the daffodil, the narcissus and the agave (American aloe). Many are highly prized in gardens and hothouses. The bulbs of some species are strongly poisonous.

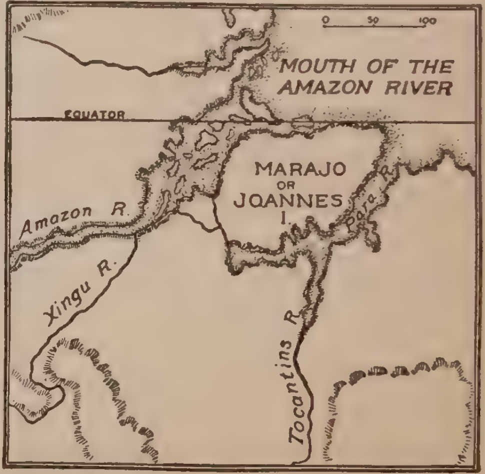
Amasia, *a mah′se ah,* a town in the north of Asia Minor, on the Irmak, 60 mi. from the Black Sea, surmounted by a rocky height in which is a ruined fortress. It has numerous mosques, richly-endowed Mohammedan schools and a number of archaic remains. The trade in silk, fruits and wines is considerable. Amasia was a residence of the ancient kings of Pontus. Population, about 30,000.

Amati, *a mah′te,* a family of Cremona who manufactured violins in the sixteenth and seventeenth centuries. Most of the violins made by them are of comparatively small size and flat model. Nicolo Amati was a tutor of Stradivarius.

Amatitlan, *ah mah teet lahn′,* a town in Central America, State of Guatemala, about 15 mi. s. of the city of Guatemala. It is a busy modern town, the inhabitants of which are actively engaged in the cochineal trade. There is a small lake of the same name close to the town. Population, 8408.

Am′auro′sis, a species of blindness in which no change shows in the appearance of the eye and which is caused by a disease of the nerves of vision. Milton, whose blindness was of this sort, called it the "drop serene." Long-continued direction of the eye on minute objects; long exposure to a bright light, to the fire of a forge, to snow; exposure to irritating gases; overfulness of blood, and disease of the brain are the most frequent causes.

Am′azon, a river of South America, the largest in the world, formed by the confluence of a great number of streams which rise in the Andes in Peru. It is formed by the union of two main branches, the Marañon, or Tunguragua, and the Ucayali, or Apurimac The united Amazon, from the mouth of the Rio Negro to Tabatinga, is known as the Solimoens. It enters the Atlantic by a mouth 150 miles wide. From its junction with the Napo in Ecuador the Amazon flows due east; it is therefore almost wholly in the same latitude, which is not the case with any other large river. The total length of the river is between 3300 and 4000 miles. In its upper course navigation is interrupted by rapids, but from its mouth upward for a distance of about 3000 miles, mostly in Brazil, there is no obstruction. It receives the waters of about 200 tributaries, 100 of which are navigable, and seventeen of these are from 1000 to 2300 miles in length, the largest being the Madeira. The Amazonian water system affords some 15,000 miles of river suitable for navigation. The rapidity of the river is considerable, especially during the rainy season, from January to June, when it is subject to floods; but there is no great fall in its course. The tides reach up as far as 400 miles from its mouth. About the time of full moon a great tidal wave rushes into the mouth of the river with such force that it raises the water almost thirty feet. This singular phenomenon is called the *bore,* or the *pororoca,* by the natives. The river swarms with alligators, turtles and a great variety of fish. Steamers and other craft ply on the river, the chief center of trade being Para, at its mouth. The Amazon was discovered by Yanez Pinçon in 1500, but the stream was not navigated by any European till 1540, when Francis Orellana descended it.



Amazons, according to ancient Greek tradition, the name of a community of women, who permitted no man to reside among them, fought under the conduct of a queen, and long constituted a formidable state. They were said to burn off the right breast, that it might not impede them in the use of the bow. Several nations of Amazons are mentioned, the most famous being those who dwelt in Pontus, who built Ephesus and other cities. They came into contact with the Greeks three times: their queen, Hippolyta, was vanquished by Hercules; they attacked Attica in the time of Theseus, and they came to the assistance of Troy under their queen, Penthesilea, who was slain by Achilles.

AMAZON, BERLIN

Ambala, *am bah'la,* or **Umballa,** *um bahl'la,* a town of India, in the Punjab, 150 mi. n. w. of Delhi. It has a flourishing trade in grain and other commodities. The town was founded in the fourteenth century. Population, 79,300.

Ambas'sador, a minister of the highest rank, employed by one prince or state at the court of another. Ambassadors are *ordinary* when they reside permanently at a foreign court, or *extraordinary* when they are sent on a special occasion. When ambassadors extraordinary have full powers, as of concluding peace, making treaties, and the like, they are called *plenipotentiaries.* Until recently the United States sent no ambassadors to foreign countries, but were represented by *ministers-plenipotentiary,* appointed by the president with approval of the Senate. In 1896 the ministers to Germany, France, England and Italy were raised to the rank of ambassadors in recognition of similar action upon the part of those governments, and since that time other ambassadorships have been named, including the post at Japan.

Ambato, *am bah'to,* or **Asiento de Ambato,** *a syayn'to da am bah'to,* a town of Ecuador situated on the n. w. slope of Chimborazo, 78 mi. s. of Quito. The location is nearly 9,000 feet above the sea and in the midst of an earthquake region. The town has an important trade in the products of the neighboring country, and in grain, sugar and cochineal. Population about 8000.

Am'ber, a fossilized resin of pale yellowish or brown color. It is brittle and translucent and possessed of a resinous luster. It burns with a yellow flame, emitting a strong odor and considerable smoke, leaving an ash which is used as the basis of the finest black varnish. Electricity was first discovered in this substance which becomes highly electric under friction. The Greek name for amber is *electron,* and from this the word electricity is derived. It is known that amber was once in liquid form, as the remains of insects are often found imbedded in specimens. These remains tell us that amber is a product of a former geological age, for all the insects preserved in it are of extinct species. Amber is found in the largest quantities on the Prussian coast of the Baltic Sea, where it is sometimes cast up by the waves, but it is generally dug from a deposit of carbonized wood, which is from forty to fifty feet below the surface. It is usually found in small pieces, but occasionally lumps weighing twelve or fifteen pounds are obtained. Amber is quite extensively used in the manufacture of mouthpieces for pipes and for cigar holders.

Ambergris, *am'bur grees,* a substance derived from the intestines of the sperm-whale and found floating near the seashore. It is a yellowish or blackish white, fatty substance with a very agreeable odor, and is used in perfumes.

Amboy'na, Amboina or **Apon,** one of the Molucca Islands, in the Indian Archipelago, close to the large island of Ceram. It is about 30 miles long and 10 miles wide. Here is the seat of government of the Dutch residency or province of Amboyna, which includes also Ceram, Banda Isles, Buru and other islands. Amboyna affords a variety of useful trees, including the cocoanut and sago palms, and cloves and nutmegs are the staple productions. The capital, also called Amboyna. is situated on the Bay of Amboyna, and is well built and defended by a citadel. Population, 38,663.

Ambrose, *am'broze,* SAINT (about 340–397), one of the early Fathers of the Church, famed for his wisdom and gentleness. When elected bishop of Milan in 374 his modesty prevented him from accepting the place at once, though later in that position he earned the reverence of every one by his excellent character. He was the warm friend of Monica, the mother of Augustine, and the adviser of the latter. His works, which may be had in English translations, are still considered authoritative by the Church.

Ambrosia, *am bro'zhah,* with nectar, the food and drink of the gods. The term ambrosia was sometimes used to mean both food and drink and was regarded as the main cause of the gods' eternal youth. They not only ate it and drank it, but bathed in it and anointed themselves with it. Sometimes as a punishment they were deprived of it for a time, and their power grew perceptibly less. If a mortal, on the other hand, was fed on ambrosia, he acquired the strength of a god and became immortal.

Am'bulance, a four- or two-wheeled wagon fitted up for the conveyance of injured persons. In the armies of the world the term is applied to movable field hospitals, especially those controlled by the Red Cross Society. Every principal city in America has its hospitals and police departments equipped with excellent ambulances in the charge of qualified surgeons. These vehicles, having the right of way over other vehicles, respond to accident calls sent by the police, and render most efficient first aid to the injured and then convey them to hospitals or homes. Ambulances are also provided for the conveyance of injured animals.

Amend'ment, an alteration or change in a law or a proposal to change a law or to change a resolution already under discussion in a public meeting. When amendments are made in either house of Congress upon a bill which passed the other, the bill, as amended, must be sent back to the other house for concurrence. The Constitution of the United States contains a provision for its own amendment as follows:—

"The Congress, whenever two-thirds of both houses shall deem it necessary, shall propose amendments to this Constitution; or, on the application of the legislatures of two-thirds of the several states, shall call a convention for proposing amendments, which, in either case, shall be valid to all intents and purposes, as part of this constitution, when ratified by the legislatures of three-fourths of the several states, or by conventions in three-fourths thereof, as the one or the other mode of ratification may be proposed by the Congress; provided, that no amendment which may be made prior to the year 1808 shall in any manner affect the first and fourth clauses in the ninth section of the first article; and that no state, without its consent, shall be deprived of its equal suffrage in the Senate."

In parliamentary bodies a bill or resolution may be amended, and this amendment may be amended, but the amendment to the amendment cannot be amended.

Amer'ica or The New World, named from Americus Vespucius, who discovered a portion of the continent. The American continent consists of the grand divisions, North America and South America, with their attendant islands. Each of these divisions is also called a continent. Its greatest extent from north to south is about 9000 miles, its greatest breadth is 3300 miles, and the total area, including islands, is about 16,000,000 square miles. The coast line measures 44,000 miles. The continent is bordered on the north by the Arctic Ocean, on the east by the Atlantic and on the west by the Pacific, while the Antarctic or Southern Ocean touches the extreme southern point. The American continent forms the barrier which divides the Atlantic and Pacific oceans for their entire length. The grand divisions are connected by the Isthmus of Panama, which at its narrowest point is only 28 miles in width. In general outline and structure, the two grand divisions are quite similar, being triangular, with the vertex at the southern point. A high mountain range extending nearly the entire length of each grand division upon the west, a low mountain range approximately parallel to the coast on the east and much shorter than the western range, and a central plain or plateau between, constitute the characteristic features of each grand division. In the northwest, the continent approaches within about 50 miles of Asia, from which it is separated by Bering Strait. America presents a marked contrast to the Old World, since its greatest extent is from north to south, reaching from one frigid zone to the other, while the greatest extent of Eurasia is from east to west. For a detailed description of the grand divisions, see NORTH AMERICA; SOUTH AMERICA; also CENTRAL AMERICA.

American Association for the Advancement of Science, THE, is one of the most noted scientific societies in the United States. It was organized as the Association of American Geologists and Naturalists, but in 1847 the name was changed to American Association for the Advancement of Science. The purpose of the organization is to encourage and promote scientific work and research and to gain an extended influence for all scientific movements. The society is divided into nine sections: mathematics and astronomy, physics, chemistry, mechanical science and engineering, geology and geography, zoology, botany. anthropology, economic science and statistics. Among its members, which number about 3500, are found the most prominent leaders of American science, as well as many educators and other noted men who are in sympathy with the work. The association holds yearly meetings which last one week. During this time the sections meet separately. An annual volume of proceedings is published and constitutes one of the most valuable contributions to scientific literature.

American Beauty, an elegant cultivated rose which was first grown in hothouses of the United States. The large, showy flowers, with velvety petals of a deep, rich red, grow quite tall on stiff, thick, woody stems. Owing to their fragrance and beauty the flowers are popular and often expensive.

American Federation of Catholic Societies, THE, has for its objects "the cementing of the bonds of federal union among the Catholic laity and the Catholic societies of the United States; the fostering and protecting of Catholic interests and works of religion, piety, education and charity; the study of social conditions and the encouragement of the spread of Catholic literature and of the circulation of the Catholic press." The headquarters of the federation are at Cincinnati, Ohio.

American Forestry Association, a society organized in 1882 for the purpose of promoting means for caring for and making a wise use of the forest resources within the United States. The association was incorporated in 1897. It comprises about two thousand members and holds annual meetings, usually in those sections of the country where it feels that its influence is most needed. The work of the association consists in securing legislation favorable to the preservation of forests, disseminating knowledge of the best methods of forestry and educating in a general way those who are interested in forest preservation. It publishes *Forestry and Irrigation,* which is its official organ. The office of the secretary is at Washington, D. C.

American Goldfinch, Yellowbird or **Thistle-bird,** often incorrectly called the wild canary. The male is a bright yellow with black cap, wings and tail, and the female a yellowish brown. In spring these birds may be seen in small flocks feeding on thistle seeds or hemp seeds. They rarely light upon the ground except when drinking. The name yellowbird is also given to the little American yellow warbler. See BIRDS, *color plate,* Fig. 3; NEST, *color plate,* Fig. 3.

American Indians. See INDIANS, AMERICAN.

Amer'icanisms, a term applied to certain words and idioms of the English language peculiar to the United States. They may be words that have originated in America; words that are used in America while they have become obsolete in Great Britain, or words that are used in America in a different sense from that understood in Great Britain. Many Americanisms have come into reputable use, but others are merely local and may be regarded as barbarisms. Following are a few of the more common Americanisms:

Around or *round,* about or near. To *hang around* is to loiter about a place.
Backwoods, the partially cleared forest regions in the western states.
Baggage, luggage.
Blizzard, a fierce storm of snow or sleet.
Bogus, false, counterfeit.
Boss, an employer or superintendent of laborers, a leader.
Bronco, a native or Mexican horse of small size.
Bug, a coleopterous insect, that is, a beetle.
Buggy, a four-wheeled vehicle.
Bulldoze, to, to intimidate voters.
Bureau, a chest of drawers, surmounted by a mirror; called in England, a dressing-table.
Calculate, to suppose, to believe, to think.
Canebrake, a thicket of canes.
Canyon, a deep gorge between high, steep banks worn by water courses.
Caucus, a meeting of the leading politicians of a party to lay the plans for an approaching election or to decide upon any course of action.
Chunk, a short, thick piece of wood or any other material.
Clever, good-natured, obliging.
Cowboy, a cattle herder or drover on the western plains.
Cowhide, a whip made of twisted strips of rawhide.
Creek, a small river or brook; not, as in England, a small arm of the sea.
Creole, a person of French or Spanish descent who is a native of Louisiana or one of the adjoining gulf states.
Cunning, small and pretty.
Dead-heads, people who have free admission to entertainments, or who have the use of public conveyances, or the like, free of charge.
Depot, a railway station.
Down east, in or into the New England states. *A down-easter* is a New Englander.
Drummer, a commercial traveler.
Dry goods, a general term for such articles as are sold by linen-drapers, haberdashers and hosiers.

Dude, a dandy, one who dresses in the extreme of fashion.
Fall, autumn.
Fix, to, to put in order, to prepare, to adjust, to repair.
Fixings, arrangements, dress, embellishments, luggage, furniture, garnishings of any kind.
Gerrymander, to, to arrange political divisions so that in an election one party may obtain an advantage over its opponent, even though the latter may possess a majority of votes in the state; from the deviser of such a scheme, Elbridge Gerry, governor of Massachusetts.
Given name, a Christian name.
Grit, courage, spirit, mettle.
Guess, to, to believe, to suppose, to think, to fancy.
Gulch, a deep, abrupt ravine, caused by the action of water.
Happen in, to, to happen to come in, to call.
Help, a servant.
Highfalutin, inflated speech, bombast.
Hoe-cake, a cake of Indian meal baked on a hoe or before the fire
Hustle, to, to hurry.
Jew, to, to haggle, or to "beat down" in price.
Johnny-cake, a cake made of Indian corn meal; the term is also applied to a New Englander.
Lasso, to, to catch horses or cattle by means of a rope or thong of leather with a running noose.
Likely, promising.
Loafer, a lounger, a vagabond.
Lobby, to, to solicit members of a legislative body for the purpose of influencing their votes.
Log-rolling, a system of political coöperation or scheming.
Lot, a piece or division of land, an allotment.
Lumber, timber sawed for use; as beams, joists, planks.
Lynch law, an irregular species of justice executed by the populace or a mob, without legal authority or trial.
Mocassin, a shoe of soft leather, originally worn by the American indians.
Muss, a state of confusion.
Notions, a term applied to every variety of small wares.
One-horse; a one-horse thing is a thing of little value or importance.
Pickaninny, a negro child.
Planks, in a political sense, are the several principles which appertain to a party; *platform* is the collection of such principles.
Reckon, to, to suppose, to think.
Rile, to, to irritate, to drive into a passion.
Rooster, the common domestic cock.
Saloon, a tap-room.
Scalawag, a scamp, a scrapegrace.
Shanty, a temporary hut.
Sick, ill.
Skedaddle, to, to run away; a word introduced during the Civil War.
Smart, often used in the South in the sense of considerable.
Span, of horses, two horses as nearly as possible alike, harnessed side by side.
Spread-eagle style, a compound of exaggeration, bombast, mixed metaphor, etc.
Spry, active.
Squelch, to, to silence or put down.
Stampede, the sudden flight of many individuals.
Store, a shop, as a book *store*, a grocery *store*.
Strike oil, to, to come upon petroleum; hence, to make a lucky hit, especially financially.
Succotash, an Indian dish made of maize and beans boiled together.
Tenderfoot, a newcomer; used especially in the West.
Truck, the small produce of gardens.
Trust, an organization for the control of several corporations.
Ugly, ill-tempered, vicious.
Vamose, to, to run off.
Wilt, to, to fade, to decay, to droop, to wither.

American Party. See KNOW-NOTHINGS.

American Race or **Red Race.** See INDIANS, AMERICAN.

Amer'icus, GA., the county-seat of Sumter co., 70 mi. s. w. of Macon, on the Central of Georgia and the Georgia & Alabama railroads. The city is in a cotton and sugar-cane district and has foundries, machine shops and chemical works. Americus was settled in 1832 and incorporated in 1855. The waterworks are owned and operated by the municipality. Population in 1910, 8063.

Amer'icus Vespucius, *ves pu'she us*, (1451–1512), a maritime discoverer, after whom America was named. He was born at Florence, Italy. In 1499, in the employ of Spain, he coasted along the continent of America for several hundred leagues; and again in 1503, under Portuguese auspices, he explored South America from Cape Saint Roque to Cape Frio. From 1505 to his death he was pilot-major of Spain, and did much to further exploration and discovery. His name was first suggested by a map-maker, as a fit name for the New World (meaning Brazil), was later applied to South America and finally extended to both continents.

Ames, FISHER (1758–1808), an American statesman and orator, born at Dedham, Mass. He graduated at Harvard in 1774, was admitted to the bar, and became widely known for his articles in favor of strong central government. He labored earnestly for the ratification of the Constitution and was elected to Congress, becoming famous as a public speaker. He is especially known for his eulogy on Washington, before the Massachusetts legislature. He declined the presidency of Harvard in 1804.

Ames, OAKES (1804–1873), an American financier and legislator, born in Easton, Mass. He was congressman from 1862 to 1873 from Massachusetts, and was interested in contracts for building the Union Pacific railroad. His connection with the Credit Mobilier led to a congressional investigation; he was censured and withdrew from political life. though it appeared that he did not purposely do wrong.

Amesbury, *aymz′ber ry*, Mass., a town in Essex co., 42 mi. n. of Boston, on the Boston & Maine railroad. It has a public library and contains manufactures of carriages, hats shoes, cotton goods and other articles. John Greenleaf Whittier lived here after 1836 until his death. The town was separated from Salisbury and called New Salisbury in 1654, incorporated in 1666 and given its present name the next year. Population in 1910, 9894.

Am′ethyst, a purple variety of quartz, which usually occurs in crystals, forming very beautiful specimens. The coloring is supposed to be due to manganese. Amethyst is found in Siberia, India, Ceylon and numerous other places. In the United States it occurs in largest quantities around Thunder Bay on Lake Superior. The oriental amethyst is a beautiful and costly gem, and is a variety of corundum. The Greeks believed amethyst to be a protection against the effects of intoxicating liquors and hence gave it its name, which means *without wine*. Among them it is worn by those who were addicted to drunkenness. It is needless to say that it has never been known to effect a cure.

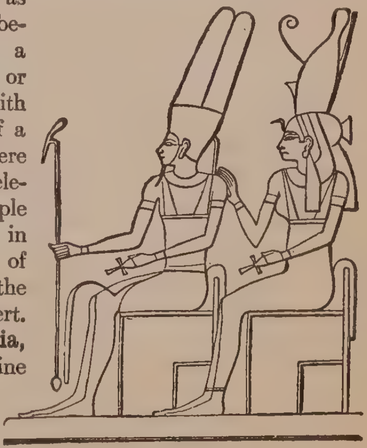
Am′herst, Mass., a town in Hampshire co., 23 mi. n. of Springfield, on the Boston & Maine and the Central Vermont railroads. It is the seat of Amherst College and of the Massachusetts Agricultural College. The location is beautiful, in the Connecticut Valley within sight of Mount Holyoke and other mountains. The place was probably settled in 1703 and was known successively under various names until its incorporation in 1759. Population in 1910, 5112.

Amherst College, a college located at Amherst, Mass. It was established by an association of Congregational and Presbyterian ministers in 1815, and was the outgrowth of Amherst Academy. Six years later it was opened as a college and is ranked as one of the foremost colleges of New England. It is celebrated for its adherence to classical and general culture and for never attempting to do university work. The faculty numbers about fifty, and its average enrollment is over 500. The library has over 80,000 volumes, and the annual income of the college is about $110,000.

Amicis, *ah me′ches*, Edmondo de (1846–), popular Italian author. His first literary success came to him with the publication of *Bozzetti*, a volume of army sketches, and this was followed, after some years of travel, by several brilliant volumes describing his journeys in Spain, England, Holland and Turkey. He also wrote a number of historical novelettes which have been very popular, and afterwards turned his attention to educational subjects. A volume of sketches called *The Heart of a Boy*, which gives in the words of a boy his school experiences for a year, is perhaps his most popular book.

Amiens, *ah′myaN′*, a city of France, situated on the Somme River, 81 mi. n. of Paris. The most noted building is the cathedral, which is the largest ecclesiastical structure in France and is considered one of the finest examples of Gothic architecture in Europe. It was begun in 1220 and took nearly seventy years for completion. It has a spire 360 feet high. Among the other public buildings are the lyceum, theological seminary and municipal library, which contains over 100,000 volumes. The manufactures include linen, woolen and silk goods, plush and shoes. Population in 1901, 90,758.

Am′mon, an ancient Egyptian deity, identified by the Greeks and Romans with Jupiter, and represented as a human being with a ram's head, or simply with the horns of a ram. There was a celebrated temple of Ammon in the Oasis of Siwah in the Libyan desert.


AMMON AND MUT

Ammo′nia, an alkaline substance, which differs from the other alkalies by being gaseous, and is hence sometimes called the *volatile alkali*. It is a colorless, pungent gas, composed of nitrogen and hydrogen. It was first procured in that state by Priestley, who termed it *alkaline air*. He obtained it from sal-ammoniac by the action of lime, by which method it is yet generally prepared. It is used for many purposes, both in medicine and chemistry, sometimes in the gaseous state, but generally in solution in water, under the names of *liquid ammonia*, *aqueous ammonia* or *spirits of hartshorn*. It may be procured naturally from decaying animal substances; artificially it is chiefly obtained from the distillation of coal and of refuse animal substances, such as bones, clippings and shavings of horn, hoof, etc. It may also be obtained from vegetable matter when nitrogen is one of its elements. Sal-ammoniac is the chloride of ammonium.

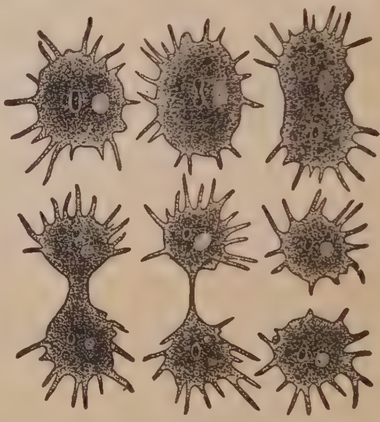
Am'monite, a fossil animal allied to the nautilus, having a many-chambered shell like a curved ram's horn. In some forms it is found in immense numbers and of great size.

AMMONITES

Ammo'nium, the name given to the supposed base of ammonia, similar to a metal, as potassium. It has not been separated as such, but it is believed to exist in an amalgam with mercury.

Ammunition, *am'mu nish'un*, the ball, powder and primer necessary to the firing of a gun. For all small arms and usually for small cannon the entire charge is put up in cases of brass or brass and pasteboard, and is known as *fixed ammunition* (See Cartridge). In the larger guns the projectile is first put into the breach and after it, is packed in the powder, either in a brass case or, if too heavy for handling in one package, in cloth bags. The primer is used to explode the charge. Ammunition for the army is largely manufactured in government works, and a great variety of powder charges, explosives and shells is used. The use of rapid-fire and automatic guns has made it necessary to have a larger quantity of ammunition with an army than has previously been required, and this has increased the difficulties of keeping the firing line well supplied.

Amoeba, *a me'ba*, one of the smallest and simplest animals in the world. It can be found in almost any pool of stagnant water, and clings to weeds, dead leaves and other objects under the surface. It cannot be seen with the naked eye, and rarely becomes more than 1–100th of an inch in diameter. It appears like a shapeless blob of jelly, and is in reality the substance called protoplasm (See Protoplasm). The central part of the amoeba is semi-transparent and resembles ground glass in appearance. Around the outer edge is a border of perfectly transparent and colorless substance. Within the granular part may be seen a small brown mass which is a little darker than the rest and is called the *nucleus*. Another little structure in the granular part is a clear, rounded space which disappears periodically with a sudden contraction and then slowly reappears. Under the microscope the amoeba is seen to change its form frequently by sending out little finger-like processes called *pseudopodia*. This process starts as a little pimple-like elevation which grows in size as the body flows toward it. Of course the volume of the amoeba is not changed, and whatever is protruded from one part of the body must be withdrawn from another. Whenever one of these pseudopodia comes in contact with anything digestible, the amoeba flows around it and is capable of digesting the food as though a special stomach had been improvised. When the process of digestion is over, the waste matter is pushed through the side opposite to that on which it entered. Amoebas are reproduced by simple process of division; a line forms through the nucleus and through the protoplasm, a single amoeba becoming two.


AMOEBA
Showing six stages in the process of reproduction.

Amoor, *ah'moor*, **River**. See Amur.

A'mos, one of the minor Hebrew prophets and supposed author of the book which bears his name. He was a herdsman and prophesied, it is supposed, about 760 B. C. His prophecies were directed against the idolatrous nations around him and against the Jews themselves for their idolatry. His writings, which are marvels of clearness and of vigor, were edited at a period long after his death.

Amoy', a seaport town of China, situated nearly opposite the center of the island of Formosa, on the south end of the island of Amoy. It is at the mouth of two united rivers, and its harbor is one of the best on the Pacific. The imports are cotton, opium, metals, clocks, indigo and grain, and the exports are tea, camphor, sugar, earthenware and paper. The town was captured by the British in 1841, and by the Treaty of Nanking in 1842 this port with others was opened to their trade. Population, 96,370.

Ampere, *ahN pare′*, ANDRÉ MARIE (1775-1836), a French scientist and mathematician, born at Lyons. In 1801 he became professor of physics in the central school of the department of Ain at Bourg. Later he went to Paris, where he acquired a wide reputation as a teacher in the polytechnic school. In 1824 he was appointed professor of experimental physics in the College de France. Ampere is widely known on account of his discoveries in electricity. He published several scientific works and numerous papers, periodicals and reports. See MAGNETISM.

Amphibians, *am fib′e anz*, a class of vertebrate animals which in their early life breathe by gills and afterward partly or entirely by lungs. They are called amphibians because of their ability to live either on land or in water. In some species the gills are retained through life, although lungs also are developed. There are a number of different divisions of this class, among which the most noteworthy are the batrachians, or tailless amphibians. See BLINDWORM; FROG; NEWT; TOAD.

Amphictyonic, *am fic′te on′ic*, **Council,** in ancient Greece, a confederation of tribes for worship and for the protection of sacred lands and treasures. It also discussed questions of international law and matters affecting the political union of the tribes. It was composed of the twelve northern tribes and met alternately at Delphi and Thermopylae. The tribes sent two deputies each, who quelled the public dissensions and the quarrels of individual cities by force or persuasion and punished civil and criminal offenses, particularly transgressions of the law of nations and violations of the temple of Delhpi.

Amphion, *am fi′on*, in Greek mythology the son of Jupiter and Antiope, and the husband of Niobe. He was instructed in music by Mercury or, according to others, by Apollo, and his skill was so wonderful that when he was set to build the walls of Thebes, he simply played on his lyre, and the stones moved and arranged themselves in their proper positions.

Amphitheater, *am′fe the′a tur*, an ancient Roman edifice of elliptical or circular form, without a roof, having a central area, the arena, encompassed with rows of seats, rising higher as they receded from the center, on which people used to sit to view the combats of gladiators and of wild beasts, and other sports. The first amphitheater of wood in Rome was erected in 46 B. C. by Caesar, and in 30 B. C., under Augustus, the first amphitheater partly of stone was built. The example of the Romans was followed by all the large cities throughout the Empire. The Colosseum, or Flavian Amphitheater, at Rome is the largest of all the ancient amphitheaters, being capable of seating from 50,000 to 80,000 persons (See COLOSSEUM). That at Verona is one of the best examples remaining. Its dimensions are 502 feet by 401, and 98 feet high.

Am′puta′tion, in surgery, that operation by which a limb or other member is separated from the body. Amputations have been practiced from very early times, but in the larger operations death was almost sure to follow from bleeding or from blood-poisoning It was not until late in the seventeenth century that surgeons learned how to stop bleeding, and much later before they could keep out infection (See SURGERY). In the amputation of a limb the flesh is cut in a slanting direction to the bone so as to leave one or more flaps of flesh. The bloodvessels are tied up, the bone sawed off, and the flaps brought smoothly over the stump and stitched down.

Amritsar *um rit′sahr*, or **Amritsir,** a flourishing commercial town of Hindustan, capital of a district of the same name in the Punjab, the principal place of the religious worship of the Sikhs. It receives its name from the sacred pond constructed by Ram Das, the apostle of the Sikhs, in which the Sikhs and other Hindus immerse themselves that they may be purified form all sin. It has considerable manufactures of shawls and silks and exhibits the richest products of India. Population in 1901, 162,548.

Am′sterdam (dam of Amstel), one of the chief commercial cities of Europe, the chief city of Holland. On account of the lowness of the site of the city, the greater part of it is built on piles. It is divided by numerous canals into about ninety islands, which are connected by nearly three hundred bridges. The harbor, formed by the Y, an arm of the Zuyder Zee, lies along the whole of the north side of the city and is surrounded by various docks and basins. The trade is facilitated by the great ship canal, 15 miles long, 22 to 26 feet deep, which was completed in 1876 and which connects the Y directly with the North Sea. Another canal, the North Holland Canal, 46 miles long and 20 feet deep, connects Amsterdam with the Helder. Among the principal buildings in Amsterdam are the palace or town hall, the new *Stadthuis*, the Bourse. the *Rijks Museum* and the New Church, founded in 1408. The city is also well supplied with hospitals and charitable and educational institutions. The chief manufactures are tobacco, glass, soap, jewelry, linen, silk and machinery. One of the chief industries is diamond-cutting, for which Amsterdam is especially famous. The commerce is enormous, and the city is one of the first centers in the world. Amsterdam ranks much higher as a trading town than as a manufacturing town. During the seventeenth and eighteenth centuries it was one of the wealthiest and most flourishing cities in the world. Its forced alliance with France ruined its trade, but since 1813 its commerce has revived. Population in 1900, 510,850.

Amsterdam, N.Y., a city in Montgomery co., 33 mi. n. w. of Albany, on the Mohawk River, on the Erie Canal and on the New York Central and the West Shore railroads. It is in an agricultural district and has many factories producing knit goods, carpets, steel springs, paper and other articles. The city has a good drainage system and water supply, has electric railroads and is lighted by electricity. The first settlement was made in 1778, and it was known as Viedersburg until 1804. Amsterdam was incorporated as a city in 1885. Population in 1910, 31,267.

Amu, *ah moo′*, or **Amu-Darya,** *ah moo′dahr′ya*, (ancient Oxus), a large river of central Asia that rises in the Pamir between Bokhara and India, flowing northwesterly into the Sea of Aral. Its length is about 1600 miles, 800 of which are navigable for light boats. In its course the Amu receives a number of tributaries and in historic times has frequently changed its course. As late as the early part of the sixteenth century it flowed into the Caspian Sea. This river is of importance because it is the source of water for the irrigation of the surrounding country.

Am′ulet, an object, either of stone or other substance, engraved with figures or characters, and worn as a protection against misfortune and disease. The Jews brought amulets into Christian Europe; but under the Council of Laodicea the use of them was strictly prohibited. However, the Turks, the Chinese and most of the peoples of central Asia have still great faith in the powers of amulets. See TALISMAN.

Amundsen, ROALD (1870–), a Norwegian navigator and explorer, born in Christiania, Norway, and educated in the public schools. At 25 he joined a south polar expedition and on his return, became acquainted with Dr. Nansen, the Arctic explorer. In 1902 Amundsen decided to locate the north magnetic pole and find the northwest passage. Early in 1903 he left Christiania in the ship *Goja*. In the summer of 1905, he brought the *Goja* through Bering Strait into the Pacific Ocean, being the first to make the passage.

Amur or **Amoor,** *ah moor′*, a river of eastern Asia, formed by the union of the Shilka and Argun rivers at the north end of the Khingan Mountains. It flows first in an easterly direction and then southeast along the northern boundary of Manchuria. At the eastern boundary of Manchuria it flows northward until it empties into the strait, opposite the island of Saghalien, which opens into the Sea of Okhotsk. The principal tributaries are the Sungari and Ussuri, on the right, and the Seya and Bureya, on the left. The Amur is about 2680 miles long. For the most part it is open for navigation and is valuable for commerce. The great steamer station is Khaborovsk, which is connected by rail with Vladivostok, the capital of the Amur province. The river affords an outlet and an ice-free port on the Pacific, the goal which has long been desired by the Russians.

An′abap′tists, a name given to a Christian sect because, as they objected to infant baptism, they baptized all those who joined them. In 1520, owing to the influence of Münzer and others, Switzerland became a center for Anabaptists, from which they spread to the Netherlands and Westphalia. In 1534 the town of Münster in Westphalia was their center of action. Bockhold became leader, assuming the name of John of Leyden, king of the New Jerusalem and the city was the scene of cruelty, fanaticism and crime until the Protestant princes put an end to it. The doctrine of rebaptism was spread by disciples of Bockhold, but they adopted less obnoxious views and tried to found a community of pure Christians.

Anab′asis (a going up), the Greek title of Xenophon's celebrated account of the expedition of Cyrus the Younger against his brother Artaxerxes, king of Persia. The title is also given to Arrian's work which records the campaigns of Alexander the Great.

Anachronism, *a nak′ro nizm,* an error of chronology by which things are represented as co-existing which did not co-exist. Anachronisms are sometimes made purposely for the sake of effect, as in the old epics the heroes are always young, the heroines always beautiful. In art some of the most glaring instances have occurred in the works of the Dutch school, where, for instance, scriptural characters were sometimes represented as armed with guns or as dressed in the costume of the seventeenth century.

An′acon′da, the popular name of two of the largest species of the serpent tribe. The Ceylonese species is said to reach thirty-three feet in length; the other, a native of tropical America, the largest of the serpents, attains the length of forty feet. The name is often applied to any large snake that crushes its prey. See Boa; Python.

HEAD OF THE ANACONDA

Anaconda, Mont., the county-seat of Deer Lodge co., 27 mi. n. w. of Butte, on the Northern Pacific, the Great Northern and other railroads. The copper smelting works in the city are among the largest in the world. There are also railroad shops, foundries, machine-shops and brick yards. Deposits of graphite and sapphires are found in the vicinity. The city has public parks, two opera houses and the Hearst Free Library. The place was settled in 1884 when the reduction works were established, and has developed with the copper industry. Population in 1910, 10,134.

Ana′creon (561–476 b. c.), a Greek lyric poet, a native of Teos, in Ionia. Only a few fragments of his works have come down to us; the collection of odes that usually passes under the name of Anacreon is mostly the production of a later time.

Anaemia, *a nee′me ah,* a diseased condition in which the blood becomes very much weakened and, in consequence, weakness, palpitation of the heart and shortness of breath afflict the subject. The more severe form of the disease is usually fatal, while the secondary anaemia, which is an accompaniment of many diseases, may be cured by nourishing food, fresh air and medicines that tend to strengthen the blood.

An′agram, a word, phrase or sentence formed by transposing the letters of another word, phrase or sentence so as to make an entirely different meaning. Thus, the letters in the name *Florence Nightingale* make "Flit on, cheering angel." The force of an anagram depends on its containing exactly the same letters as the original word or phrase and on its having some connection, eulogistic or humorous, with the original name or thought. In former times the making of anagrams was a very popular pastime and many men of great ability did not find it beneath them to use their ingenuity to this end, but at present the device has gone out of fashion except in the puzzle columns of magazines.

An′akim, the children of Anak, the son of Arba, noted in sacred history for their fierceness and their great stature. Their stronghold was Kirjath-Arba, or Hebron. They were scattered over the hills in Israel and Judah and were conquered by Joshua.

Anal′ysis, the separation of anything into its elements. In philosophy it is the mode of resolving a compound idea into its simple parts, in order to consider them more distinctly and arrive at a more precise knowledge of the whole. It is opposed to *synthesis,* by which we combine and class our perceptions and contrive expressions for our thought so as to represent their several divisions, classes and relations.

In chemistry, analysis is the process of taking apart a compound substance with a view to determine either (*a*) what elements it contains (*qualitative analysis*), or (*b*) how much of each element is present (*quantitative analysis*). Thus by the first process we learn that water is a compound of hydrogen and oxygen, and by the second that it consists of one part of hydrogen by weight to eight parts of oxygen.

An′alyt′ical Geom′etry, a branch of geometry which investigates the relations of geometric figures by means of algebraic symbols and methods. It had its origin in the fact that every geometric relation is capable of being expressed by an algebraic equation, and that this is often the most simple and convenient way of expressing it. This equation, when solved by algebraic methods, may be translated into geometrical language, the values of the unknown quantities representing the coördinates of successive points in the geometrical figures (See Coördinates). To illustrate: From the algebraic equation $5x+6y—15$, we may derive the expression $y=\frac{15—5x}{6}$. Substituting different values for x in this equation, the value of y may be readily found as follows: If $x=\frac{6}{10}$, $y=2$. If $x=1$, $y=1\frac{2}{3}$. If $x=1\frac{8}{10}$, $y=1$, etc. These pairs of values represent pairs of coördinates of different points. When plotted with reference to two perpendicular lines, these points describe a straight line. See COÖRDINATES; GEOMETRY.

Anam′. See ANNAM.

An′ani′as, the name of three biblical characters: 1. A disciple at Jerusalem who, with his wife Sapphira, kept back a part of the price of land they had sold, and told the disciples they were giving all. They were both struck dead for the crime (*Acts* V, 1–10). 2. A high priest at Jerusalem (*Acts* XXIII, 2). 3. A disciple at Damascus (*Acts* X, 10–17).

Anarchists, *an′ahr kists,* a revolutionary sect or party, setting forth, as the social ideal, the extreme form of individual freedom, holding that all government is injurious and immoral, that the destruction of every social form now existing must be the first step to the creation of a new and just society. The anarchists first assumed independent importance about 1872, when they separated from the Social Democrats. Their principal journals have been *La Revolte* (Paris), the *Freiheit* (New York), *Liberty* (Boston) and the *Anarchist* (London). The Anarchists in America have accomplished little, though they maintain an active propaganda.

Anat′omy, the science which treats of the structure of animals and plants, is divided into numerous branches. *Animal* anatomy treats of the structure of animals; *vegetable* or *plant* anatomy, of the structure of plants; while *human* anatomy pertains to the structure of the human system. *Comparative* anatomy relates to the study of animals with a view to comparing their structure with that of the human body or with that of animals of different orders. Previous to the Christian era, little was known of the structure of the human system. Most peoples held the body sacred after death and dissection was not allowed. The earliest dissection was among the Greeks, about 450 B. C. At this time Hippocrates and his school obtained some knowledge of the skeleton and the larger internal organs. Dissection was first practiced in public at the Alexandrian School, where considerable advance was made in the knowledge of human anatomy, but prejudice against the practice was so strong that it was given up and nothing further was achieved for several hundred years. In the thirteenth and fourteenth centuries the value of dissection for those studying medicine became evident, and the rulers of leading European nations ordered a certain number of dissections in the medical schools each year. From this the practice became general in all universities having medical schools attached to them.

At the present time the science of anatomy has reached a high degree of perfection in all the medical colleges of America and Europe, and each of the branches of human anatomy has been itself divided into numerous subdivisions; so that physicians who wish to become specialists, after obtaining a general knowledge of the human system, confine their investigations to one branch, such as histology, or to the eye or the brain and nerves. Anatomy is closely related to surgery, since the successful surgeon must be acquainted with the position and structure of every organ in the body. See ABDOMEN; BRAIN; MUSCLES; NERVES; SKELETON and many kindred topics.

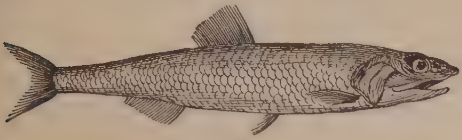
An′axag′oras (500–428 B. C. an ancient Greek philosopher of the Ionic school, who gathered around him a circle of renowned pupils, including Pericles, Euripides and Socrates. At the age of fifty he was publicly charged with impiety and sentenced to perpetual banishment.

Anax′iman′der (611–547 B. C.), an ancient Greek (Ionic) philosopher, was born at Miletus. According to his philosophy, the firmament is composed of heat and cold, the stars of air and fire. The sun occupies the highest place in the heavens, has a circumference twenty-eight times larger than the earth, and resembles a cylinder, from which streams of fire issue. The moon is likewise a cylinder, nineteen times larger than the earth. The earth has the shape of a cylinder, and is placed in the midst of the universe, where it remains suspended.

An′axim′ines of Miletus, an ancient Greek philosopher, according to whom air was the first principle of all things. He flourished about 550 B. C.

Anchor, *an′kor,* an instrument of iron or other heavy material used to prevent a ship from drifting. The invention of so necessary an instrument is to be referred, as may be supposed, to the remotest antiquity. The most ancient anchors consisted merely of large stones, baskets full of stones, sacks filled with sand or logs of wood loaded with lead. The ordinary modern anchor has two spade-like points or *flukes* at the end of a shank, to which the anchor chain is fastened. A crossbar is usually added, so arranged that a horizontal pull on the chain will drive one of the flukes into the ocean bottom. To loosen the anchor, a vertical pull is necessary. Patent anchors have two flukes, pointing in the same direction and loosely bolted to the shank, so that they will turn and both take hold of the earth at once.

Ancho′vy, a small fish of the herring family. The common anchovy, esteemed for its rich and peculiar flavor, is not larger than the middle finger. It is caught in vast numbers in the Mediterranean and frequently on the coast of France, Holland and the south of England. A similar species is found on both the Atlantic and Pacific coasts of America.


ANCHOVY

Anchovy Pear, the fruit of a tree which grows about fifty feet in height, a native of Jamaica. The tree has large leaves and large white flowers, and it bears a fruit somewhat bigger than a hen's egg. This fruit is pickled and eaten like the mango, which it strongly resembles in taste.

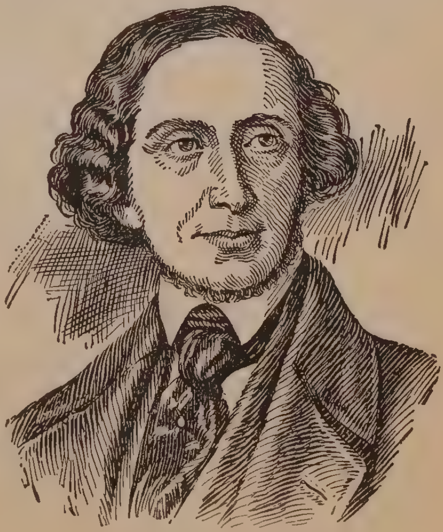
Ancient Order of United Workmen, a fraternal benevolent organization founded at Meadsville, Pa., in 1868. It is governed by a "supreme lodge" which has control over the "grand" or "state" lodges, which in turn govern the subordinate lodges. It pays a benefit of $2000 to families of deceased members. In 1905 the order had 39 grand lodges, 5000 sub-lodges and 313,000 members. It had disbursed since its organization nearly $145,000,000 in benefits.

Ancona, *an ko′na,* a seaport of Italy, capital of the province of the same name, 185 mi. n. e. of Rome. It is built on the slope of a hill and is divided into two parts, the old and the new city. Among the remarkable structures are a triumphal arch of white marble, erected in honor of Trajan, and the Cathedral of Saint Cyriac, built in the eleventh and twelfth centuries. Ancona is a station of the Italian fleet, and the commerce is considerable. The town is, next to Venice, the principal Italian port on the Adriatic. It is said to have been founded about four centuries before the Christian era. It fell into the hands of the Romans in the first half of the third century B. C. and became a Roman colony. Population in 1901, 57,000.

Andalusia, *an′da loo′ze ah,* a large and fertile district in the southern part of Spain. Its area is about 33,500 sq. mi., including the modern provinces of Seville, Huelva, Cadiz, Jaen, Cordova, Granada, Almeria and Malaga. It is traversed by mountains, the loftiest being the Sierra Nevada. Minerals abound, especially in the province of Huelva, where famous copper mines are situated. The principal river is the Guadalquivir, in whose valley the grape, myrtle, olive, palm, banana and carob grow abundantly. Wheat, maize and barley grow almost spontaneously, and honey, silk and cochineal are largely cultivated. The horses and mules are the best in Spain; the bulls are sought for bull-fighting, and fine sheep are reared in vast numbers. Manufactures are not extensive. The Andalusians are descended in part from the Moors, of whom they still preserve decided characteristics. Population, 3,562,600.

An′damans, a chain of islands on the east side of the Bay of Bengal, 680 mi. s. of the mouth of the Ganges. The surface is densely covered with forests which yield valuable timber, and the soil is very fertile. The inhabitants are small, generally much less than five feet, well formed and active, skillful archers and canoeists and excellent swimmers and divers. These islands have been used since 1858 as a penal settlement by the Indian government, the settlement being at Port Blair, on South Andaman. Population, about 15,000.

Andersen, *ahn′dur s'n,* Hans Christian (1805–1875), a Danish novelist, poet and writer of fairy tales, born at Odense. He was put to work early, but managed in his leisure moments to pick up the beginnings of an education. In 1819 he went to Copenhagen, determined to


HANS CHRISTIAN ANDERSEN

make his fortune as a dramatist, and although he wrote nothing of note his abilities brought him friends, who procured him free entrance into a government school at Slagelse. From this school he was transferred to the university, and while there he published a volume of poems which attracted some notice. He received a royal grant to enable him to travel, and in 1833 he visited Italy, his impressions of which he published in *The Improvvisatore*. The scene of his following novel, *O. T.*, was laid in Denmark, and in *Only a Fiddler* he described his own early struggles. In 1835 appeared the first volume of *Fairy Tales*, for which he is most famous. Among his other works are the *Picture-book without Pictures; A Poet's Bazaar; The Two Baronesses*, written in English, of which he had gained command during a trip in England; an autobiography, *My Life's Romance*, and *In Sweden*. Andersen's genius was fully recognized before his death, and high honors were shown him in his old age. While no one has ever been able to look at things more completely from a child's point of view, or so to delight children, Andersen did not like children, nor was he attractive to them.

An'derson, Ind., the county-seat of Madison co., 36 mi. n. e. of Indianapolis, on the west fork of the White River and on the Chicago & Southeastern, the New York Central (C. C. C. & St. L.) and other railroads. The city has a hydraulic canal with a fall of almost 50 feet and a good supply of natural gas. Its manufactures include iron and steel products, glass, strawboard and tile. Anderson owns and operates its waterworks, artificial gas and electric-light plants and has several parks. It was settled in 1823. Near the city are some of the mounds of the prehistoric Mound Builders. Population in 1910, 22,476.

Anderson, S. C., the county-seat of Anderson co., 125 mi. n. w. of Columbia, on the Southern and other railroads. It is in an agricultural region and its manufactures include cotton products, wearing apparel, fertilizers, flour and machinery. Anderson Female College and Patrick Military Institute are located here. A private corporation owns an electric power plant on the Seneca River, from which the city and the neighborhood secures much of its power and light. This same company controls the water supply. Anderson was settled in 1827. Population in 1910, 9654.

Anderson, Marie Antoinette (1859–), commonly known as Mary Anderson, an American actress, born in Sacramento, Cal. She studied for the stage under Charlotte Cushman and on her first appearance as Juliet, in 1875, scored a distinct success. In this rôle and in that of Rosalind in *As You Like It*, Meg Merrilies in *Guy Mannering* and Perdita in *A Winter's Tale*, she retained her popularity until her withdrawal from the stage in 1889. In the following year she married Antonio Navarro de Viana.

Anderson, Robert (1805–1871), an American soldier, born in Kentucky. He served in the Black Hawk, Florida and Mexican wars and was wounded at Molino del Rey. As major of artillery he was in charge of Forts Moultrie and Sumter on the outbreak of the Civil War, and bravely defended Sumter. He was promoted to the rank of major general. See Fort Sumter.

An'dersonville, Ga., a village in Sumter co., situated 62 mi. s. of Macon, and of historic importance because it was the site of the most noted Confederate prison during the Civil War. In 1863 the Confederate government enclosed 16½ acres of ground near the village with a stockade fifteen feet high. The following June this was increased to 26½ acres, but a portion of this was useless because of a stream flowing through the ground and forming a marsh. Within this enclosure at times as many as 33,000 Union prisoners were confined. They had no shelter and their surroundings were extremely filthy and unhealthy. Between Feb. 15, 1864, and May 1, 1869, nearly 50,000 men were imprisoned at Andersonville, of whom about 13,000 died. When Sherman's army marched through Georgia the Confederates were obliged to abandon Andersonville, and the prisoners were removed to Milan, Ga., and then to Florence, S. C., where conditions were much more favorable. See Civil War in America.

Andes, *an'deez*, (Spanish, *Cordillera de los Andes*, or *Cordilleras*), a range of mountains stretching along the whole of the west coast of South America, from Cape Horn to the Isthmus of Panama and the Caribbean Sea. In absolute length (4500 miles) no single chain of mountains approaches the Andes, and only a certain number of the higher peaks of the Himalayan chain rise higher above the sea level. Several main sections of this huge chain are distinguishable. The southern Andes present a lofty main chain, with a minor chain running parallel to it on the east, from Terra del Fuego and the Straits of Magellan northward, rising in Aconcagua to a height of 22,860 feet. North of this is the double chain of the central Andes, inclosing the wide and lofty plateaus of Bolivia and Peru, which lie at an elevation of more than 12,000 feet above the sea. The mountain system is here at its broadest, being about 500 miles across. Here are also several very lofty peaks, as Illampu or Sorata (21,484 feet), Sahama (21,054 feet), Illimani (21,024 feet). Farther north the outer and inner ranges draw together, and in Ecuador there is but one system of elevated masses, generally described as forming two parallel chains. In this section are crowded together a number of lofty peaks, most of them volcanoes, some extinct and some active. Of the latter class are Sangay (17,460 feet) and Cotopaxi (19,550 feet). The loftiest summit here appears to be Chimborazo (20,581 feet); others are Antisana (19,260 feet) and Cayambe (19,200 feet). Northward of this section the Andes break into three distinct ranges, the eastmost running northeastward into Venezuela, the westmost running northwestward to the Isthmus of Panama. In the central range is the volcano of Tolima (17,660 feet). The western slope of the Andes is generally exceedingly steep, the eastern much less so, the mountains sinking gradually to the plains.

There are about thirty volcanoes in a state of activity. The loftiest of these seems to be Gualateiri (21,960 feet) in Peru. All the districts of the Andes system have suffered severely from earthquakes, many towns having been entirely destroyed. Peaks crowned with perpetual snow are seen all along the range, and glaciers are also met with, especially from Aconcagua southward. The passes are generally at a great height, the most important being from 10,000 to 15,000 feet. Railways have been constructed to cross the chain at a similar elevation. The Andes are extremely rich in the precious metals, gold, silver, copper, platinum, mercury and tin; lead and iron are also found. The animal and plant life of the Andes is abundant and varied. In these mountains are towns at a greater elevation than anywhere else in the world, the highest being the silver mining town of Cerro de Pasco (14,270 feet), the next being Potosi.

Andor'ra or **Andorre,** a small, nominally independent state in the Pyrenees, with an area of about 175 sq. mi. and a population of about 6000. It has been a separate state for six hundred years, is governed by its own civil and criminal codes and has its own courts of justice, the laws being administered by two judges, one of whom is chosen by France, the other by the Bishop of Urgel, in Spain. The chief industry is the rearing of sheep and cattle. The capital is Andorra and has a population of about 1000.

An'dover, MASS., a town in Essex co., 22 mi. n. of Boston near Lawrence, on the Shawsheen River and the Boston & Maine railroad. The Andover Theological Seminary, Phillips Academy for boys and Abbot Academy for girls are located here. The town has a public library and owns and operates the waterworks. It contains manufactures of twine, thread, woolen and rubber goods, shoes, ink and other articles. The place was settled in 1643 and the town incorporated in 1646. It was the birthplace of Elizabeth Stuart Phelps Ward, and Harriet Beecher Stowe also lived here for a time. Population, including several villages, in 1910, 7301.

Andrassy, *ahn'drah she,* COUNT JULIUS (1823–1890), a Hungarian statesman. He took part in the revolution of 1848 and was condemned to death, but escaped and went into exile. After his return in 1861 he served in the Diet. and when self-government was restored in Hungary in 1867 he was appointed premier. He became imperial minister for foreign affairs in 1871, retiring from public life in 1879.

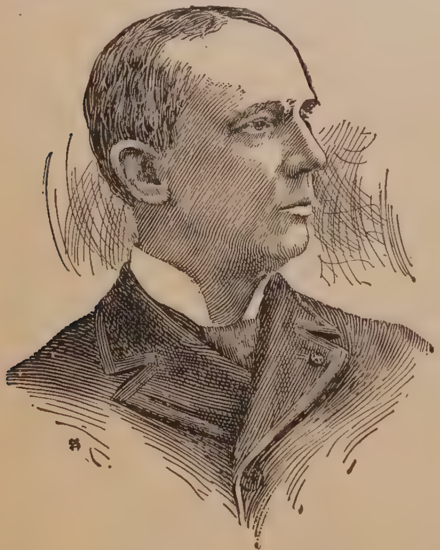
An'dré, JOHN (1751–1780), a major in the British army during the Revolutionary War. Employed to negotiate the treason of the American general, Arnold, and the delivery of the works at West Point, he was taken September 23, 1780, within the American lines, declared a spy and hanged October 2, 1780. His remains were taken to England in 1821 and interred in Westminster Abbey, where a monument has been erected to his memory. Much sympathy was felt for him in the patriot army, but military jurists are agreed that his punishment was merited and necessary. His own letter to Washington was so frank an admission of guilt as to warrant his conviction, and his one chance of escape was destroyed by the British refusal to surrender Arnold. André's personal characteristics made him a universal favorite.

Andree, *ahn'dray,* SALOMON AUGUST (1854–1897), a distinguished Swedish civil engineer and scientific aëronaut, who proposed in 1895 to make a journey to the North Pole by balloon. He constructed a balloon that would hold gas for three months, with provision to refill if necessary, and buoyant enough to carry three persons, with provisions and apparatus. In 1897 Andree with two companions left Spitzbergen on an expedition to the north polar regions, and they have not been heard of since. Several expeditions went in search of the unfortunate aëronauts, but no trace of them was found.

An'drew, an apostle, brother of Simon Peter, and, like his brother, a fisherman of Galilee. He was originally a disciple of John the Baptist and is supposed to have been Christ's first disciple. According to tradition, he preached in Scythia, Achaia, Colchis and Epirus. There is no mention made of him in the Acts of the Apostles, but there are four important references to him in the gospels.

Andrew, John Albion (1818–1867), an American statesman, born in Albion, Maine. He was graduated at Bowdoin, studied law and was admitted to the bar at Boston. He became an anti-slavery man and was elected to the legislature in 1858. In 1860 he was elected governor of Massachusetts on the Republican ticket. To this office he was reëlected until 1866. During his whole service he devoted himself to the Union cause and did much to secure speedy and united action upon the part of Northern states in favor of the government.

An'drews, Elisha Benjamin (1844–), an American educator, born at Hinsdale, N. H. He served in the Union army during the Civil War and rose to the rank of second lieutenant. He completed his education at Brown University and Newton Theological Institution, then became professor of history and political economy at Brown, from which he was appointed to the chair of political economy and finance in Cornell University. After retaining this position for nine years, he was elected president of Brown University, and under his administration the efficiency and scope of work in this institution were largely increased. Later Doctor Andrews became superintendent of the public schools of Chicago, which position he held for two years, when he was appointed chancellor of the University of Nebraska. In 1909 he resigned his position because of failing health. He is the author of *Institutes of General History, Institutes of Economics* and *A History of the United States in Our Own Times.*



ELISHA BENJAMIN ANDREWS

Andrews, Saint, an ancient city in Fifeshire, Scotland, 31 mi. n. e. of Edinburgh. The trade and manufactures are of no importance, but the town is in favor as a watering-place, and the manufacture of golf balls and clubs is extensively carried on. The University of Saint Andrews, founded in 1411, is the oldest of the Scotch universities. Population in 1901, 7621.

Andrews, Stephen Pearl (1812–1886), American writer and antislavery leader. He studied at Amherst College, removed to New Orleans and subsequently lived in Texas, Boston and New York City. He was an accomplished linguist, a writer on phonography and the inventor of a universal language.

Andromache, *an drom'a kee,* in Greek mythology, wife of Hector, one of the most attractive female characters of Homer's *Iliad.* The passage describing her parting with Hector when he was setting out to his last battle is well known and much admired. Euripides and Racine have made her the chief character of tragedies.

Androm'eda, in Greek mythology, daughter of the Ethiopian king Cepheus and of Cassiopeia. Cassiopeia boasted that her daughter surpassed the Nereids, if not Juno herself, in beauty, and the offended goddesses prevailed on their father, Neptune, to afflict the country with a horried sea-monster, which threatened universal destruction. To appease the offended god, Andromeda was chained to a rock, but was rescued by Perseus. After death she was changed into a constellation.

Andronicus, Livius, the most ancient of the Latin dramatic poets, who flourished about the middle of the third century B. C. He was by origin a Greek, and long a slave. A few fragments of his works have come down to us.

Androni'cus Cyrrhestes, *sir res'teez,* a Greek architect, who flourished about 100 B. C., and who constructed at Athens the Tower of the Winds, an octagonal building, still standing. On the top was a Triton, which indicated the direction of the wind. Each of the sides had a sort of dial, and the building formerly contained a clepsydra or water-clock. In medieval times this structure was called "The Lantern of Demosthenes."

An'dros, Sir Edmund (1637–1714), an English colonial governor in America. He was first made governor of New York in 1674, and there made a creditable record for honesty and ability, though he finally was removed because of political quarrels. He then became governor of New England, which had been made into one province, and from 1686 to 1689 he ruled with unprecedented tyranny. It was during this administration, when he made his famous expedition to Hartford to demand the Connecticut charter, that that instrument was hidden in the so-called Charter Oak. He was finally removed at the revolution in 1688, but three years later became governor of Virginia, where he served for six years to the satisfaction of all.

An'droscog'gin, a river of Maine, formed by the junction of the Magalloway and a small stream flowing from Umbagog Lake. It flows in an irregular course southward and enters the Kennebec. Its length is 160 miles

Andros Island, one of the islands of the Cyclades in the Grecian Archipelago. It is 25 miles long and 9 miles wide. Andros, the capital, carries on an extensive foreign trade. The island was successively in the hands of the Athenians, Macedonians and Romans. It forms at present a part of Greece. Population, 19,000.

Anemograph, *a nem'o graf,* an apparatus attached to a wind vane or anemometer to make it self-recording. The most common form of anemograph consists of a cylinder moved by clock-work. The cylinder is covered by a paper ruled in squares. The vertical lines indicate the hour and minute spaces and the horizontal lines the velocity of the wind per hour. As the cylinder revolves a pencil registers the velocity of the wind. See Anemometer.

An'emom'eter, an instrument for measuring the force and velocity of wind. The instrument which has yielded the best results and is in most general use consists of four hemispherical cups attached to the ends of equal horizontal arms crossing at right angles and attached at their center to a vertical axis which turns freely. The lower end of this axis contains an endless screw which meshes into a train of wheelwork. When the disk revolves it causes a needle to move over a cylinder which is turned by clock-work. This cylinder is covered with a graduated paper divided by vertical lines into hour and minute spaces and by horizontal lines into spaces indicating the velocity of wind in miles per hour. The cylinder is so graduated that its rotation corresponds to the movement of the hour hand of a clock. By means of this apparatus the velocity of the air current can be recorded for each hour and minute of the day.

The velocity of the wind is from two and one-half to three and one-half times that of the cups in the anemometer. This being known, the calculation of the velocity from the readings of the instrument is very simple. In city stations of the weather bureau, anemometers are placed on the tallest buildings, where the currents of air are free from obstruction. For this reason the velocity of wind measured will always be a little more than that of the current at the surface of the earth, because of the resistance encountered.

The pressure of wind is determined from its velocity according to the following rule, which is universally employed by the United States weather bureau: Multiply the area of the surface, in square feet, by the velocity of wind in miles per hour, and this product by .004. Thus the pressure rising from an air current having a velocity of 25 miles per hour would be 25 times .004, which equals .1 pound on each square foot of surface of any object directly in the path of the wind.

Anem'one or **Wind Flower,** a name given to many species of plants belonging to the crowfoot or buttercup family. The *wood anemone* is a common wild flower of the eastern United States; the *pasque flower* in earliest spring adorns the wooded hills of the middle states, and a large number of beautiful species in various countries have been cultivated for a long time. Many showing a great variety of brilliant colors have been developed to a large size, and in some species the petals are very numerous, making a solid flower as double as the rose. (See illustration on next page.)

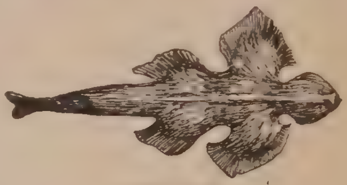
Anem'oscope, any contrivance indicating the direction of the wind. The name is generally applied to a vane which turns a spindle descending through the roof to a chamber, where, by means of a compass-card and index, the direction of the wind is shown.

An′esthet′ic, anything used for the removal of pain, especially in surgical operations, by deadening sensibility, either locally or generally. Various agents have been employed for both of these purposes, from the earliest times, but the scientific use of anesthetics may be said to date from 1800, when Sir Humphrey Davy made experiments with nitrous oxide, and recommended its use in surgery. In 1818 Faraday established the anesthetic properties of sulphuric ether, but this agent was not used practically with success until about thirty years later, when two American dentists began to use it in the extraction of teeth and in other surgical operations. A little later an English physician found chloroform to be in some respects superior to ether. This agent has since been most extensively used, though the use of ether still largely prevails in the United States. In their general effects ether and chloroform are very similar; but the latter tends to enfeeble the action of the heart, while the former weakens the lungs. For this reason great caution has to be used in administering chloroform where there is weak heart action. Local anesthesia is produced by isolating the part of the body to be operated upon, and producing insensibility of the nerves in that locality. Dr. Richardson's method is to apply a spray of ether, which, by its rapid evaporation, chills and freezes the tissues and produces complete anesthesia. A valuable local anesthetic now employed is cocaine, which enables the surgeon to perform small operations on such delicate organs as the eye or ear. Many drugs taken internally will relieve pain, but they should be used sparingly and only on the advice of a physician.

ANEMONE

Angel, *ayn′jel,* one of those spiritual intelligences who are regarded as dwelling in heaven and employed as the ministers or agents of God. Scripture frequently speaks of angels, but with great reserve, Michael and Gabriel alone being mentioned by name in the canonical books, while Raphael is mentioned in the Apocrypha.

Angel Fish, known in America as the monk fish, a fish nearly allied to the sharks, very ugly and voracious, preying on other fish. It is from three to four feet long, and takes its name from its pectoral fins, which are very large, extending horizontally like wings when spread. This fish connects the rays with the sharks, but it differs from both in having its mouth placed at the extremity of the head. It is found in tropical seas, in the Mediterranean and in the warmer parts of North America.



ANGEL FISH

Angelico, *an jel′i co,* Fra (1387–1455), the common name of Fra Giovanni da Fiesole, one of the most celebrated of the early Italian painters. He entered the Dominican order in 1407 and was employed by Cosmo de Medici in painting the convent of San Marco and the church of Saint Annunziata with frescoes. These pictures gained him so much celebrity that Nicholas V invited him to Rome to ornament his private chapel in the Vatican and offered him the archbishopric of Florence, which was declined. Angelico stands as the type of the purely religious painter. His works were considered unrivaled in finish and in sweetness and harmony of color and were made the models for religious painters of his own and succeeding generations. The best of his work is now to be seen at Rome, in the Vatican, and in the frescoes at San Marco, in Florence, and many of his paintings are found in the galleries of Europe. *The Last Judgment*, the *Madonna of the Star* and the *Coronation of the Virgin* are some examples of his art. See MADONNA.

Angell, JAMES BURRILL (1829–), an American educator, born in Scituate, R. I. He graduated in 1849 from Brown University, traveled and studied for two years in Europe, and after his return was appointed to a professorship of modern languages and literature at Brown University. This position he held for seven years. From 1860 to the close of the Civil War he was editor of the *Providence Journal*, and in 1866 he was elected president of the University of Vermont. Five years later he gave up this position to accept that of president of the University of Michigan. Under Dr. Angell's administration the work of this institution was broadened and developed, until now it stands in the front rank, not only of the state universities, but of all the universities of the country. Especially was his work directed toward bringing the university, even the professional and graduate schools, into the closest possible touch with the entire educational system of the state. It has been said of him that "his wide culture, his personal kindliness, his catholic intelligence and his general learning have had quite as much influence as specific words or acts or any university policy."

In addition to his work as an educator, Dr. Angell held various diplomatic positions. From 1880 to 1881 he was United States envoy extraordinary and minister plenipotentiary to China; in 1887 he was made a member of the Anglo-American International Commission on Canadian Fisheries, and in 1896 he was made chairman of the Canadian-American Commission on a Deep Waterway from the Great Lakes to the Sea. In 1897 he was appointed minister to Turkey, but he gave up the position in the following year, and returned to the University of Michigan. He wrote a *Manual of French Literature*, *Progress of International Law* and numerous contributions to the *North American Review* and other leading periodicals of the country. In October, 1909, Dr. Angell retired from active life and became president emeritus. He has received degrees from the leading American universities.

Angelo, *an'jel o,* MICHAEL. See MICHELANGELO.

Angelus, *an'je lus,* a prayer recited by the Roman Catholics at morning, noon and evening, at the ringing of the angelus bell. The name comes from the opening words of the prayer, "Angelus Domini nuntiavit Mariae." The devotion is in memory of the annunciation to the Virgin Mary by Gabriel that she should be the mother of Christ. The custom at present is to say the prayer at 6 A. M. and 6 P. M. In a famous picture called *The Angelus*, J. F. Millet (1859) represented two peasants stopping their work in the field at the sound of the bell. Millet sold the picture for a small sum. The American Art Association purchased it for 580,000 francs and exhibited it in the United States. M. Chanchard bought it in 1890 for $150,000.

Angers, *ahN'zhay',* a town and river port of France, 5½ mi. from the Loire, 150 mi. s. w. of Paris. Angers has an old castle built by Saint Louis about the middle of the thirteenth century, now used as a prison, barracks and powder magazine. The manufactures of the town are sail cloth, hosiery, leather, chemicals and foundry products. In the neighborhood are immense slate quarries. Population in 1901, 74,421.

Angina, *an ji'na,* **Pec'toris** or **Heart Spasm,** a disease characterized by an extremely acute pain, felt generally in the lower part of the sternum, and extending along the whole side of the chest and into the corresponding arm; by a sense of suffocation, faintness and apprehension of approaching death. The attacks rarely occur before middle age, are more frequent in men than in women and generally indicate organic heart disease.

Angiosperms, *an'je o spurmz,* the greatest group of plants, both in numbers and importance, having about one hundred thousand species and forming the most prominent part of the vegetation of the earth. They are of all sizes, varying from minute water plants to gigantic trees. The name is derived from the fact that the seeds are enclosed in a seed case, in contrast with the exposed seeds of the gymnosperms. Cross fertilization is effected among the angiosperms not by the wind, but by various insects which carry the pollen from the stamens to the pistils. This fact is to a large extent the cause of the great variety in the structure of the flowers belonging to this group. There are two great divisions of the angiosperms, the monocotyledons or endogens and the dicotyledons or exogens (See BOTANY). To the former division belong such forms as grasses, palms, lilies and orchids, and to the latter, common trees, buttercups, roses, mints and many others.

An′gle, a portion of space lying between two lines which meet at one point, or between two or more plane surfaces meeting at a common point or line. A *plane* angle is the portion of a plane surface that lies between two straight lines meeting at a common point. A *curvilinear* angle is one whose sides consist of two curves or of a line and a curve. A *spherical* angle is one whose sides consist of two great circles of a sphere (See CIRCLE). A *diedral* angle is the angle formed by two intersecting planes. A *polyedral* angle is the angle formed by the junction at a common point of several planes. The magnitude of a plane angle depends upon the relative direction of its sides; if they are widely different in direction it is a large angle. The size of the angle is measured in degrees, a degree of angular measure corresponding to 1–360 of the circumference of a circle whose center is the vertex of the angle. A *right* angle is an angle of 90°; an *acute* angle is an angle of less than 90°; an *obtuse* angle is one of more than 90° and less than 180°; a *reflex* angle is an angle of more than 180°.

An′gler, Frog Fish or **Sea-devil,** a remarkable fish often found on the British coasts. It is from three to five feet long; the head is very wide, and both jaws have bands of long, pointed teeth inclined inward. Upon its back are spines, and around its head are fringed appendages resembling seaweed. It is also supplied with three long, bright-colored filaments which it throws out as bait to its prey. The *American angler, fishing-frog* or *goose-fish,* of the Atlantic, is from two to three feet long; it is exceedingly voracious, and its wide mouth allows it to swallow fish about as large as itself.

ANGLER

An′gles, a low German tribe, who in the earliest historical period lived in the district about Angeln, in the duchy of Schleswig, and who in the fifth century crossed over to Britain along with bands of Saxons and Jutes, and colonized a great part of England and a portion of the Lowlands of Scotland. The Angles formed the largest body among the Germanic settlers in Britain, and founded the three kingdoms of East Anglia, Mercia and Northumbria. From them England takes its name (Angle-land.)

Anglesey, *an′gl′se,* or **Anglesea** (ancient Mona), an island and county of North Wales, separated from the mainland by the Menai Strait. It is about 20 miles long and 17 miles wide. The chief agricultural products are oats and barley, wheat, rye, potatoes and turnips. Numbers of cattle and sheep are raised. Among the minerals the most important are copper, lead, silver and ocher. The Menai Strait is crossed by a magnificent suspension bridge, 580 feet between the piers and 100 feet above high-water mark, and also by the great Britannia Tubular Railway Bridge (See BRITANNIA BRIDGE). The chief market towns are Beaumaris, Holyhead, Llangefni and Amlwch. Population in 1901, 50,600.

An′glican Church, a term which, strictly, embraces the Church of England and the Protestant Episcopal churches in Ireland, Scotland and the colonies, but which is sometimes used to include also the Episcopal churches of the United States. The doctrines of the Anglican Church are laid down in the Thirty-nine Articles, and its ritual is contained in the *Book of Common Prayer.* Within the body there is room for considerable latitude of belief and doctrine, and three sections, differing upon these grounds, are sometimes spoken of by the names of the High Church, Low Church and Broad Church.

Angling, the art of catching fish with a hook, or *angle,* baited with worms, small fish, flies or other bait. There are occasional allusions to this pursuit among the Greek and Latin classical writers. It is mentioned several times in the Old Testament, and it was practiced by the ancient Egyptians. The oldest work on the subject in English is the *Treatyse of Fysshynge wyth an Angle,* printed by Wynkyn de Worde, in 1496, along with treatises on hunting and hawking, the whole being ascribed to Dame Juliana Berners, or Barnes, prioress of a nunnery near Saint Albans, England. Walton's inimitable discourse on angling was first printed in 1653.

The chief appliances required by an angler are a rod, line, hooks and baits. *Rods* are made of various materials and of various sizes. The cane rods are lightest, and where fishing tackle is sold they most commonly have the preference; but in country places the rod is often of the angler's own manufacture. Rods are commonly made in separate joints, so as to be easily taken to pieces and put up again. They are made to taper from the butt end to the top, and are usually possessed of considerable clasticity. In length they may vary from five feet to more than twenty, with a corresponding difference in strength—a rod for salmon being necessarily much stronger than one suited for ordinary brook trout. The *reel*, an apparatus for winding up the line, is attached to the rod near the lower end where the hand grasps the rod while fishing. The best reels are of simple construction and are so made as to wind or unwind freely and rapidly. Those of the better class run on jeweled bearings, and the cranks are so geared that when they are turned once the barrels on which the lines run turn four times. The *line* is usually made of firmly twisted fine silk. To the end of this may be tied a piece of fine gut, on which the hook or hooks are fixed. For casting heavy bait the line is a little heavier and the gut leader is discarded. The *hook* of finely tempered steel should readily bend without breaking and yet should retain a sharp point. It should be long in the shank and deep in the bend and the barb should be long. In size and shape the hooks must be adapted to the kind of fish that are angled for. In still fishing, *floats* formed of cork, goose and swan quills, are often used to buoy up the hook so that it may float clear of the bottom. For heavy fish or strong streams a cork float is used; in slow water and for lighter fish, a quill float. *Baits* may consist of a great variety, natural or artificial. The principal natural baits are common garden worms, insects or small fish (as minnows). The artificial flies so much used in angling for trout and salmon are made of hairs, furs and wools of every variety, mingled with pieces of feathers and secured together by plaited wire, gold and silver thread, marking silk or wax. The wings may be made of the feathers of domestic fowls, or any others of a showy color. Some angling authorities recommend that the artificial flies should be made to resemble as closely as possible the insects on which the fish is wont to feed, but experience has shown that the most capricious and unnatural combinations of feather and fur have been often successful where the most artistic imitations have failed. Artificial minnows and spoon-shaped pieces of metal are also used by way of bait, and are so contrived as to spin rapidly when drawn through the water in order to attract the notice of the fish. Angling, especially with the fly, demands a great deal of skill and practice.

An′glo-Sax′ons, the name commonly given to the nation or people formed by the amalgamation of the Angles, Saxons, Jutes and other German tribes who settled in Britain in the fifth and sixth centuries after Christ. These tribes, who were thus the ancestors of most of the English-speaking nationalities, came from North Germany where they inhabited the regions about the mouths of the Elbe and the Weser. Many of our modern institutions, customs and habits had their origin among these early peoples, whose strong character has placed their descendants among the leaders of the world.

Ango′la, a Portuguese territory in western Africa, s. of the Kongo; area, 500,000 sq. mi. The principal town is the seaport of Loanda, which was long the great Portuguese slave market. The chief exports of Angola are ivory, palm oil, coffee, fish, gum, wax and cotton. Population, about 4,000,000.

Ango′ra, a town in the interior of Asiatic Turkey, 215 mi. e. s. e. of Constantinople. It has considerable remains of Byzantine architecture and relics of earlier times, both Greek and Roman. All the animals of this region are long haired, especially the goats, sheep and cats. Goat-hair forms an important export, as does the fabric called camlet, which is manufactured from it. Other exports are goats' skins, dyestuffs, gums, honey and wax. Population, about 35,000.

Angostura, *ahn′gos too′rah.* See CIUDAD BOLIVAR.

Angostura Bark, the aromatic bitter medicinal bark obtained chiefly from a tree growing in the northern regions of South America. The bark is valuable as a tonic and in reducing fevers, and it is also used in the preparation of a kind of bitters. Because this bark is badly adulterated, its use as a medicine has been almost given up.

Angoulême, *ahN goo lame′*, an ancient town of western France, capital of the department of Charente, 60 mi. n. n. e. of Bordeaux. It has a fine old cathedral, a beautiful modern town hall, a lyceum, a public library, a theological seminary, a natural history museum and a hospital. There are manufactures of paper, woolens and linens, besides distilleries, sugar works and tanneries. Population in 1901, 37,650.

Angra, *ahn′gra*, a seaport of Terceira, capital of the Azores. It has the only convenient harbor in the whole group of islands. The chief trade is in wine, honey and fruits. It has a cathedral, a military college and arsenal, and is the residence of the governor general of the Azores and of the foreign consuls. Population, about 11,000.

Anguilla, *an gwil'la,* or **Snake Island,** one of the British West India islands. Sugar, cotton, tobacco and maize are grown, though not to a great extent. There is a saline lake in the center, which yields a large quantity of salt. Population, about 3800.

Anhalt, *ahn'halt,* a duchy of the German Empire, surrounded by Prussia. Its area is 886 square miles, and it is divided into two large and four smaller parts, which are all detached from one another. It is one of the oldest duchies of Europe and the reigning family has been in power for several centuries. Anhalt is an agricultural country, and the chief crops are wheat and other grains, flax, potatoes, tobacco, hops and fruits. The mountainous regions afford a good supply of minerals. There are iron works and other manufactures. Population, in 1900, 316,027.

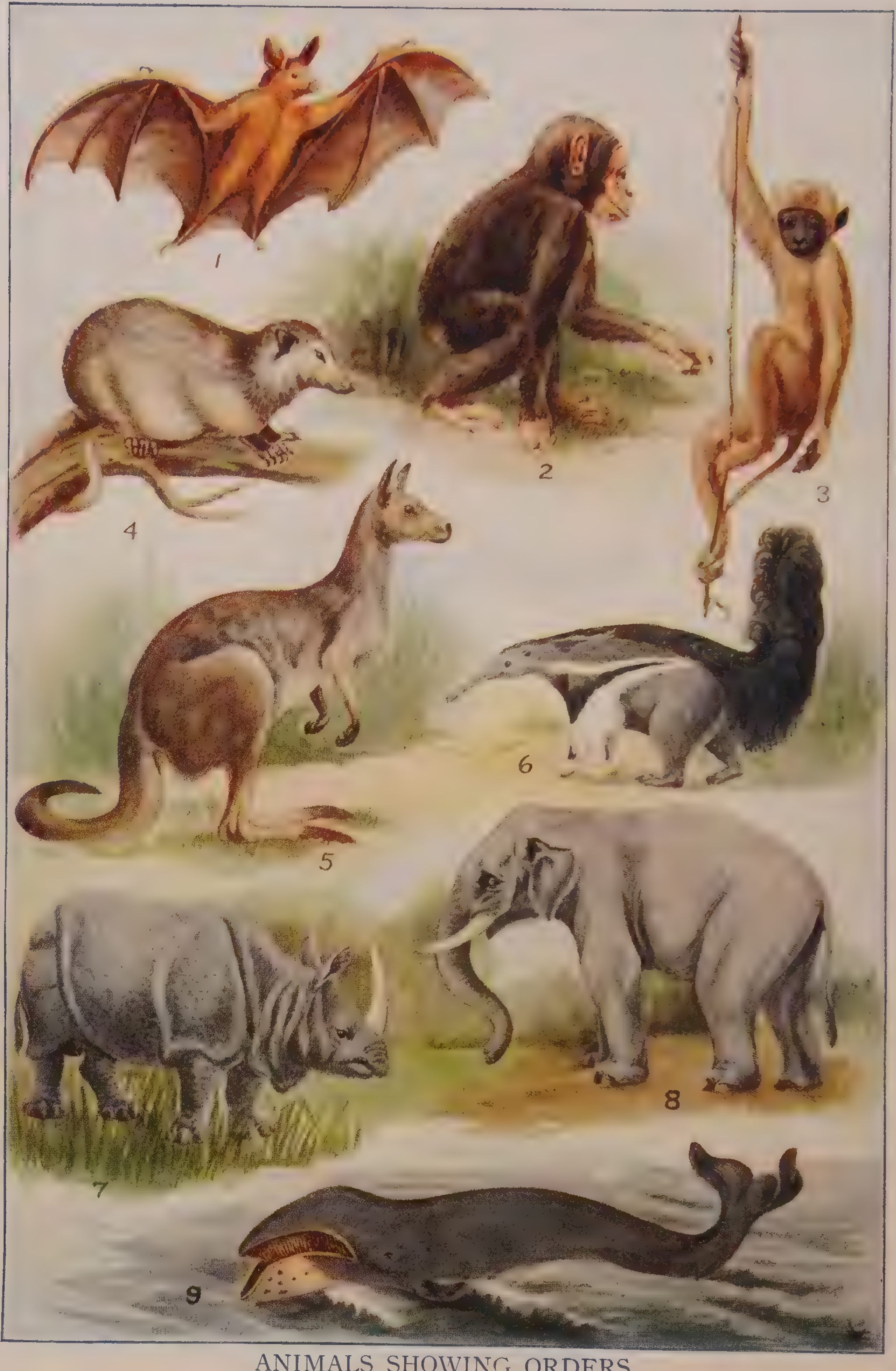
Anhy'drite, in mineralogy, a sulphate of calcium, a mineral presenting several varieties of structure and color. The *vulpinite* of Italy possesses a granular structure, resembling a coarse-grained marble, and is used in sculpture. Its color is grayish white, intermingled with blue.

An'iline, a substance which has become of great importance, as being the basis of a number of brilliant and durable dyes. It is found in small quantities in coal-tar, but the aniline of commerce is obtained from benzene or benzole, a constituent of coal-tar, consisting of hydrogen and carbon. Benzene, when acted on by nitric acid, produces nitro-benzene; and this substance again, when treated with hydrogen at the moment the latter is being made, usually by the action of acetic acid upon iron-filings or scraps, produces aniline. It is a colorless, oily liquid, somewhat heavier than water, with a peculiar, vinous smell and a burning taste. When acted on by arsenious acid, bichromate of potassium, stannic chloride and other substances, aniline produces a great variety of compounds, many of which are very beautiful. The manufacture of these aniline or coal-tar dyes as a branch of industry was introduced in 1856 by Perkin of London. Since then the manufacture has reached large dimensions.

An'imal. The simplest forms of animal life consist of one cell only, and bear very strong resemblances to the lowest orders of plant life. This simple cell is sensitive to outside influences and has the power to do in itself, without any special organs, all things necessary for its life. The higher orders of animals are composed of many, many cells, and have whole sets of most intricate organs, each with its special work to do; for instance, one set of organs is employed in the collection of food, another in its digestion, others in carrying the food through the body, bringing air into the system, carrying off waste and dead matter, or other functions. In different animals these organs vary greatly, but their purposes are the same. By form alone no true distinction can be made between plants and animals, even in many of the higher organisms, nor are their chemical characters more distinct. It is impossible to say that the power of motion belongs exclusively to animals, for some plants can move and many animals are rooted or fixed. The great distinction between plants and animals lies in the nature and mode in which they assimilate food. Plants feed on inorganic matters, and can, with few exceptions, take in food which is presented in the liquid or gaseous state only. Animals, on the contrary, require organic matter, and so are dependent upon plants or upon other animals for food. Again, animals are dependent upon a proper supply of oxygen for their life, but plants require carbonic acid, which is generally poisonous to animals. Animals receive the food into the interior of their bodies and assimilation takes place in their internal surfaces; but plants receive the food into their external bodies and effect assimilation in the external parts, for instance, in the leaf-surfaces, under the influence of sunlight (See CHLOROPHYLL). All animals require a certain degree of temperature, which in the birds and mammals is considerably elevated, varying from 96° to 100° F. For classification and for references, see the article ZOOLOGY.

Animal Intelligence. It is generally known that many animals possess in a greater or less degree the same senses that we ourselves have—sight, hearing, smell, touch, temperature and so on—and that many of them experience such emotions as anger, grief and joy; but it is not by any means so certain that they have even the elements of reason as we understand that term.

The sense of *touch* in man is keenest in the finger tips, the lips and the tip of the tongue. In the lower animals the regions of greatest sensitiveness are often different, and in some animals special and very delicate touch organs have been developed; as, for example, the whiskers of the cat and the long hair on the rabbit's lip, by means of which these animals can readily find their way in the densest darkness. The wing of the bat is also very sensitive to touch.

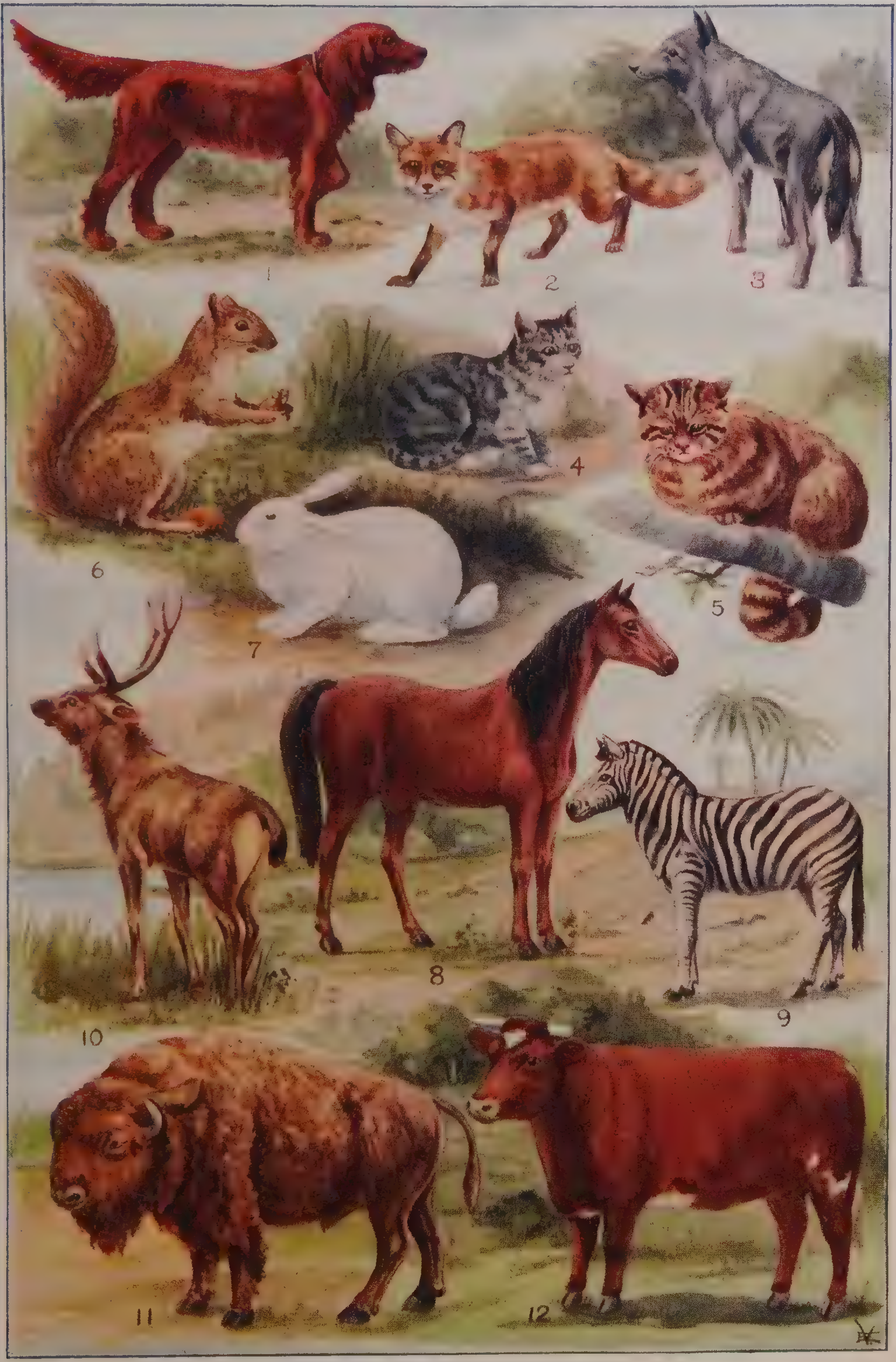


ANIMALS SHOWING ORDERS

Bats
  1, Vampire Bat.
Four-Handed Animals
  2, Baboon.
  3, Monkey.

Pouched Animals
  4, Opossum.
  5, Kangaroo.
Toothless Animals
  6, Giant Ant-Eater

Thick-Skinned Animals
  7, Rhinoceros.
  8, Elephant.
Whales
  9, Greenland Whale



ANIMALS SHOWING ORDERS

Dog Family
1, Dog.
2, Fox.
3, Wolf.

Cat Family
4, Domestic Cat.
5, Wild Cat.

Rodents or Gnawers
6, Squirrel.
7, Hare.

Horse Family
8, Horse.
9, Zebra.

Ox Family
10, Deer.
11, Bison.
12, Ox.

In man the sense of *taste* is keen and resides in the taste bulbs which cover the tongue and palate. In birds and reptiles the sense of taste is not very well developed. Insects recognize the difference between sweet and bitter, but do not seem to be affected by other flavors. Many animals show an instinctive dislike for certain foods, but it may be more from the sense of smell than from taste, for the two are very closely allied.

In some animals the sense of *smell* is exceedingly acute. The dog can track his master through the crowded street; the deer recognizes the presence of an enemy very quickly. But birds have little sense of smell, and reptiles also are dull in this respect. Fish differ; it is said that the shark is almost entirely dependent on his sense of smell for his food. In insects this sense is most keenly developed.

Most of the mammals and the birds have a keen sense of *hearing*. The astonishing manner in which some birds will imitate the songs of other birds testifies to the accuracy of their hearing; but fishes hear little, though it has been proved that they can hear to some extent. Certain insects hear and can distinguish sounds that are pitched higher than the human ear is able to recognize.

The keenness of *vision* possessed by birds is most remarkable. The swift, flying high through the air, detects on the ground its minute food. The eagle sees his prey from long distances entirely beyond the range of the human eye. Some animals, such as frogs and toads, have keen vision only at short range, and fish seem to be entirely unable to distinguish prey at any great distance from themselves. It is known that certain insects distinguish between colors.

That the higher animals have *memory* is very certain; a puppy, having been stung by a bee, will ever after avoid the insect, and may even flee at the sound of its humming. Dogs are known to have recognized their masters after years of absence, and they have been known to show strong resentment after many years against an individual who mistreated them.

Animals certainly draw inferences from what they see, but apparently in purely instinctive manner. The best writers seem to doubt whether an animal can put together different facts and establish a conclusion. The extent to which the intelligence of animals goes in this direction, however, is a subject of dispute. Some writers maintain that animals really teach their young; others protest that nothing of the sort is ever done—that the actions of a bird in throwing her young from the nest are purely instinctive, and not with any thought of the young birds' welfare. Many modern writers have taken a different stand and have written exceedingly interesting accounts and imaginative histories of many animals. See *Wild Animals I Have Known* and other stories by Ernest Thompson Seton, also the later writings of John Burroughs.

Anise, *an'is,* an annual plant, a native of the Levant, much cultivated in Spain, France, Italy and other countries, whence the *aniseed* of commerce is obtained. It has an aromatic smell, and is largely employed to flavor liquors and sweetmeats. *Star-anise* is the fruit of an evergreen Asiatic tree and is brought chiefly from China.

ANISE

Anjou, *an'joo,* an ancient province of France, having an area of about 3000 sq. mi. Anjou was in the possession of the English kings up to 1204, when John lost it to the French.

Anna Comne'na (1083–1148), daughter of Alexius Comnenus I, Byzantine emperor. After her father's death she endeavored to secure the imperial power for her husband, Nicephorus Briennius, but was baffled by his want of energy and ambition. She wrote a life of her father, which, in the midst of much fulsome panegyric, contains some valuable and interesting information. She forms a character in Sir Walter Scott's *Count Robert of Paris.*

Anna Ivanovna, *ah′na e vah′nov na* (1693–1740), empress of Russia, the daughter of Ivan, half-brother of Peter the Great. She was married in 1710 to the duke of Courland, in the following year was left a widow, and in 1730 ascended the throne on the condition proposed by the senate, that she would limit the imperial power and do nothing without the advice of the council composed of the leading members of the Russian aristocracy. But no sooner had she ascended the throne than she declared her promise null, proclaimed herself autocrat of all the Russias and ruled with great severity. Several of the leading nobles were executed, and many thousand men were exiled to Siberia.

Annam or **Anam,** *an nahm′*, the central province of French Indo-China, lying on the east side of the Indo-Chinese peninsula. It has an area of about 52,000 square miles and a population of more than 5,000,000. It is traversed from north to south by a mountain chain, the highest of whose peaks reaches nearly 9000 feet. The products of Annam include rice and other grains, cinnamon, sugar-cane, coffee, tobacco, tea and cotton, besides many valuable woods and some silk. The buffalo is used for domestic service, and the forests and jungles abound in all the large game characteristic of India. The government is in theory a monarchy, but it is in reality subject to French authority, exercised through resident agents at the capital. The Annamese are of Mongolian stock, but are smaller and less robust than most kindred peoples. Their language is similar to that of the Chinese, and their religion is Buddhism, though the educated classes have in large measure adopted Confucianism. The French began to interfere in the affairs of Annam in 1847 on the plea of protecting the native Christians, and by 1884 it had come fully under French dominion. The chief city is Hué, which has a population of more than 50,000.

Annap′olis, Md., the capital of the state and the county-seat of Anne Arundel co., 26 mi. s. of Baltimore and 37 mi. e. of Washington, on the Severn River, 2 mi. from Chesapeake Bay. The city is on the Annapolis & Baltimore Short Line and the Annapolis, Washington & Baltimore railroad, has a good harbor and is connected by boat with other points on the bay. It is situated in a fruit and berry-growing district and has an extensive oyster-packing industry. Saint John's College and the United States Naval Academy are located here (See Naval Academy, United States). Other interesting features are the statues of Chief Justice Taney and General De Kalb, the several state buildings, a convent and a house of the Redemptorist Fathers. The first settlement, called Providence, was made in 1649 by a company of Puritans from Virginia. It received a charter in 1708 and was renamed in honor of Queen Anne. The first federal constitutional convention was held here in 1786. On December 23, 1783, Washington surrendered his commission as commander-in-chief to Congress, then sitting temporarily at Annapolis, in the senate room of the state house. Population in 1910, 8609.

Annapolis (formerly Port Royal), a small town in Nova Scotia, on an inlet of the Bay of Fundy, with an important herring fishery. It is one of the oldest European settlements in America, dating from 1604. It was occupied by the British in the time of Queen Anne, whence the name. Population in 1901, 1019.

Ann Arbor, Mich., the county-seat of Washtenaw co., 38 mi. w. of Detroit, on the Huron River and on the Michigan Central and the Ann Arbor railroads. The city is in a farming region, and its manufactures include agricultural implements, woolen goods, carriages and organs. It has an excellent high school, housed in a fine, modern building. Among the other prominent buildings are the courthouse, post-office and railroad station. The place is best known as the seat of the state university (See Michigan, University of). Ann Arbor was settled in 1834 and incorporated in 1851. Population in 1910, 14,817.

Annatto, *an naht′to*, or **Arnotto,** an orange-red coloring matter, obtained from the pulp surrounding the seeds of a shrub native to tropical America, and cultivated in Guiana, Santo Domingo and the East Indies. It is sometimes used as a dye for silk and cotton goods, though it does not produce a very durable color, but it is much used in medicine for tingeing plasters and ointments, and to a considerable extent by farmers for giving a rich color to cheese. (See illustration on next page.)

Anne (1665–1714), queen of Great Britain and Ireland, was born at Twickenham, near London. She was the second daughter of James II, then duke of York, and Anne, the daughter of the earl of Clarendon. With her father's permission she was educated in the beliefs of the English Church. In 1683 she was married to Prince George, brother to Christian V of Denmark. On the arrival of the Prince of Orange in 1688, Anne wished to remain with her father; but she was prevailed upon by Lord Churchill (afterward duke of Marlborough) and his wife to join the triumphant party. After the death of William III in 1702 she ascended the English throne. Her character was essentially weak, and she was governed first by Marlborough and his wife and afterwards by Mrs. Masham. Most of the principal events of her reign are connected with the War of Spanish Succession. The only important acquisition that England made by it was Gibraltar, which was captured in 1704. Another very important event of this reign was the union of England and Scotland, under the name of Great Britain, which was accomplished in 1707. The reign of Anne was noteworthy not only for the brilliant successes of the British arms, but also for the number of brilliant writers who flourished at this time, among whom were Pope, Swift and Addison. Anne was the mother of many children, all of whom died in infancy except one son, the duke of Gloucester, who died at the age of eleven. See ENGLAND, subhead *History.*

ANNATTO

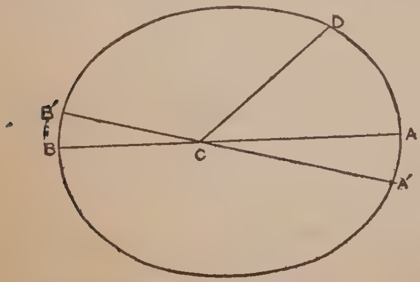
Anneal'ing, a process to which many articles of metal and glass are subjected after making, in order to render them more tenacious. Annealing consists of heating the articles and allowing them to cool slowly. When the metals are worked by the hammer, rolled into plates or drawn into wire, they acquire a certain amount of brittleness, which destroys their usefulness and has to be remedied by annealing. Annealing is particularly employed in glass works, and consists in putting the glass vessels, as soon as they are formed, and while they are yet hot into a furnace or oven, in which they are suffered to cool gradually. The toughness is greatly increased by cooling the articles in oil. See IRON; STEEL; TEMPERING.

An'niston, ALA., the county-seat of Calhoun co., 63 mi. e. of Birmingham, on the Louisville & Nashville, the Southern and other railroads. The city is beautifully located among the Blue Ridge Mountains, in a region producing coal, iron, lumber and cotton. It has extensive foundries, machine shops, rolling mills, locomotive and boiler works and manufactures of lumber, cotton and clay goods. Anniston College for Young Ladies, the Noble Institute for both sexes and the Barber Memorial Seminary for colored girls are located here. Other features of interest are the fair grounds, a public park and the fine church of Saint Michael and All Angels. Anniston was founded in 1873 by the Woodstock Iron Company. Population in 1910, 12,794.

Annu'ity, a sum of money paid annually. An annuity is usually raised by the present payment of a certain sum as a consideration, whereby the party making the payment, or some other person named by him, becomes entitled to an annuity. The rules and principles by which this present value is to be computed have been the subjects of careful investigation. This value, which is evidently a sum of money that will yield interest equal to the proposed annuity, depends upon several factors. If the annuity is to be perpetual, the present value will evidently depend upon the rate of interest on money; if the annuity is to be for life, the present value, obviously, is dependent upon not only the rate of interest, but the number of years the beneficiary will live, which in turn depends upon age, sex, climate and other influences. Tables of mortality (See MORTALITY, LAW OF) are therefore compiled for each district of a country, from which the average present value of different annuities at different ages can be found. In England and some countries on the Continent, the granting of annuities is conducted by the government, while in other European countries such a business is commonly managed by private enterprises. In the United States the granting of annuities is not commonly engaged in, being supplanted by life insurance, which, obviously, is exactly opposite in character, the difference being that small annual payments are made, with the agreement that at a certain time a lump sum will be paid to a designated beneficiary. See Insurance.

An′ode, the positive pole of an electric current, being that part of the surface of a decomposing body which the electric current enters; opposed to *cathode*, the way by which it departs.

Anom′alis′tic Year. In the accompanying diagram, suppose that when last nearest the sun a planet was at B' and that now it is at D; then if C represents the sun, the angle $B'\ C\ D$ is the *anomaly*, that is, the angle made at the center of the sun by a line drawn from the planet when it was last in perihelion and the line to its present position. The time which elapses between the sun at perihelion and the next time it reaches that point is called the anomalistic year; and as the point of perihelion moves forward a little each year, the anomalistic year is a little longer than the sidereal year, or time required for the earth to pass from one point in the heavens to this same point again. By referring to the diagram again, and supposing that the ellipse represents the orbit of the earth, AB its longer axis, and C the sun, we may suppose that the earth after leaving B returns to that point in the sidereal year, but the point of perihelion has moved forward to B' so that the earth must travel the 11.8″ farther to make up the anomalistic year, a distance which it covers in 4 minutes and 39 seconds.

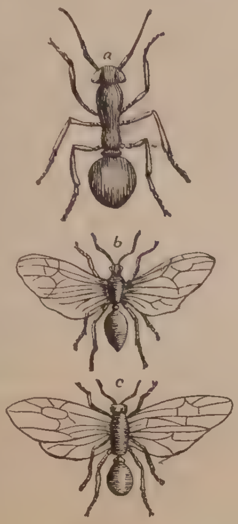


An′selm, Saint (1033–1109), a distinguished philosopher and churchman, who in 1093 was appointed archbishop of Canterbury to succeed the celebrated Lanfranc, whose pupil he was. Anselm, who is considered second only to Augustine, after leading a dissipated life embraced the doctrines of the Church and became one of the most powerful writers in her defense He was a resolute man and his unbending character led him into frequent disputes with the kings William Rufus and Henry I, through all of which he exhibited such remarkable intelligence and skill as to place him far ahead of the men of his age. The day of his death is observed by Roman Catholics.

Anso′nia, Conn., a city in New Haven co., 12 mi. n. w. of the city of New Haven, on the Naugatuck River and on the Berkshire and Naugatuck divisions of the New York, New Haven & Hartford railroad. It has important manufactures, including machinery, brass and copper goods, clocks and electrical appliances. Prominent features are the public library, Y. M. C. A. building, opera house, and Burton and Recreation parks. The place was a part of Derby until 1899 and was chartered in 1893. The city takes its name from Anson G. Phelps. Population in 1910, 15,152.

Ant, the common name of various genera of winged insects, some of which are common in most temperate and tropical regions. Like the bees and wasps, they live in communities regulated by definite laws, each member of the society doing a well defined and separate part of the work of the colony. Each community consists of males, of females much larger than the males, and of neuters, or workers. The males have wings, do no work, and most of them die in the fall. The females lay the eggs and have wings, which are used only a short time in the autumn, when some of them leave their colonies to establish new ones. The workers are wingless. They excavate the galleries of the ant hill, procure food and feed the larvae or young ants, which are unable to move. In fine weather they carry these larvae and pupae to the surface, for the warmth of the sun, and as attentively carry them back to a place of safety when bad weather is threatened or the ant hill is disturbed. In some communities there are special workers known as soldiers, because of the duties they perform and because of their powerful biting jaws.

There is great variety in the material, size and form of ant hills, or nests, according to the nature of the species. Most American ants build their nests in woods, fields or gardens, usually in the form of small mounds raised above the surface of the ground and containing numerous galleries and compartments. Some, however, excavate nests in old tree trunks. Some ants live on animal food, very quickly picking quite clean the skeleton of any dead animal they may find. In southern Europe there are ants which feed on grain and store it up in their nests for use. During the winter time ants rest in a state of torpor and so require no food. Some species live on sweet substances, especially the honey-dew which exudes from the bodies of some plant lice or aphides. Sometimes the ants herd the lice on plants, much as human beings herd cattle, and from time to time, by stroking with their antennae, draw the sweet fluid from the aphides as a cow is milked. Other insects are kept in the nests of ants and looked after in a similar manner, and certain species of ants will attack the nests of other ants, carry off their workers and compel them to serve as slaves. The marvelous intelligence of ants, and the wonderful things which they do, seem to be beyond belief. They tunnel under rivers, build bridges, unite to rescue a companion in danger, and rejoice and play like kittens.



ANTS
a, worker; *b*, male; *c*, female.

Some species are armed with stings, others with powerful mandibles or with an acrid stinging fluid which they can throw out. The *umbrella* or *parasol ant* cuts off a leaf, seizes it by the stem and carries it to his nest with the blade extending over his back like an umbrella. It is said that when an ant of a certain species dies, all the members of its community turn out together, and in solemn march carry the dead member to a suitable place, where they dig a grave and bury the dead. After these ceremonies are over the ants return in pairs to their house. The *honey ant* secretes a peculiar honey and stores it away in its abdomen until the latter becomes so swollen as to be unmanageable; then the other ants carry the honey maker into the nest and feed it carefully. In time of need they devour the honey and its maker as well. The so-called *white ants* are not true ants. See TERMITES.

Antaeus, *an tee'us*, the giant son of Neptune and Ge (the Earth), who was invincible as long as he was in contact with the earth. Hercules, challenged to combat, grasped him in his arms and stifled him suspended in the air.

Antananarivo, *ahn'ta nah'na re'vo*, the capital of Madagascar, is situated in the center of the island on a plateau having an elevation of over 4000 feet. The streets are very irregular and the buildings are constructed almost entirely of wood. The only building of note is the royal palace. The inhabitants are engaged in the manufacture of coarse textile fabrics and in other industries, but the inland position of the city, combined with poor facilities for transportation, restrict the commerce to that which is absolutely necessary. Population, between 50,000 and 70,000.

Antarc'tic Circle is an imaginary circle, parallel to the equator and distant from the south pole 23° 28′, marking the area within which the sun does not set when on the Tropic of Capricorn. The Antarctic Circle is about the average northern limit of the pack ice, and consequently is recognized by geographers as the northern limit of the Antarctic Ocean.

Antarctic Ocean or **Southern Ocean,** a large body of water around the South Pole, included within the Antarctic Circle. The term is also employed to denote the vast sea south of the Atlantic, Pacific and Indian oceans. This ocean has not been as thoroughly explored as the Arctic Ocean, and for a long time it was considered impenetrable for ships on account of the ice, which extends farther from the pole than in the Arctic Ocean. The life of the Antarctic waters is very abundant, extending from the surface to the bottom. The deep-sea fauna is richer than the corresponding fauna of the other oceans. See SOUTH POLAR EXPLORATION.

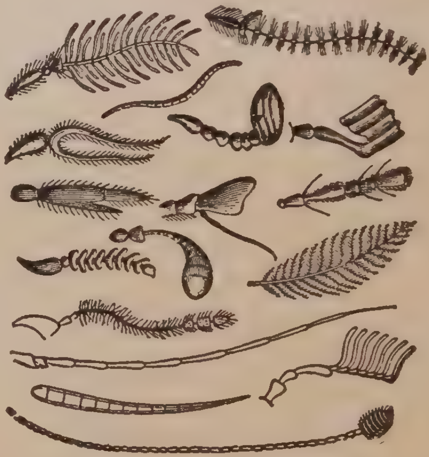
Ant'-eat'er, a name given to various mammals that prey on ants, though the name is usually confined to one genus of the toothless order. In this genus the head is long, the jaws destitute of teeth. and the mouth furnished with a long extensile tongue covered with glutinous saliva, by the aid of which the animals secure their insect prey. The eyes are particularly small, the ears short and round, and the legs, especially the anterior, very robust and furnished with long, compressed, acute nails, admirably adapted for breaking into the ant hills. The most remarkable species is the ant-bear, a native of the warmer parts of South America. It is from four to five feet in length from the tip of the muzzle to the base of the black, bushy tail, which is about two feet long. The body is covered with long hair, particularly along the neck and back. It is a harmless and solitary animal, and it spends most of its time in sleep. All are natives of South America. The name ant-eater is also given to the pangolins and to the aard-vark. The echidna of Australia is sometimes called *porcupine ant-eater*. See Aard-vark; Armadillo; Echidna.

GREAT ANT-EATER OR ANT-BEAR

An'telope, a name given to the members of a large family of mammals closely resembling the deer in general appearance, but very different in nature from the latter animals. The horns of antelopes, unlike those of the deer, are not shed annually, but are permanent and may be borne by both sexes. Antelopes, the fleetest and most graceful of animals, are shy and timid. They vary from a foot in height to the size of a horse, and in manner of life differ greatly, some living in forests and shady nooks, others in mountainous regions and others around water. At present, antelopes inhabit Asia and Africa in great numbers and are of great variety, although everywhere they are being hunted out of existence. Certain species have colors so closely resembling their surroundings that it is hard to see them. The flesh of most antelopes is considered very good, and the hides of the larger animals make excellent leather.

Among the more important species are the following: the *bushbuck,* the smallest and one of the most beautiful, called also the *harness antelope*, because of a peculiar white stripe on the body resembling a harness; the *steinbok,* a small and alert antelope, common in South Africa, reddish in color and having short ringed horns curving forward; the *guevi* or *bluebuck,* a native of Africa, rarely exceeding a foot in height; the *koodoo* or *kudu,* one of the largest species, having long twisted horns and vertical stripes on the sides of its body; the *saiga* of southern Russia, having a white nose, tufts of hair beneath its eyes and ears, and a fleecy coat; the *sable antelope* of South Africa, remarkable for its shiny black coat and for the beauty of its form, and the white *oryx* of Africa, with large sword-like horns curving backward. See Addax; Gazelle; Gnu; Pronghorn; Chamois.

Anten'nae, the feelers or first appendages upon insects, crustaceans and other animals belonging to the branch Arthropoda. The lobster has two pairs, while insects have but one. The antennae consist usually of long series of joints, sometimes more than one hundred in number, supplied with nerve branches and used by the animals for feeling their way, for testing surrounding objects and apparently for communicating with one another. Deprived of their antennae, some animals are peculiarly helpless. The antennae of moths look like feathers. On butterflies they are slender and delicate, and are tipped with little knobs. In other insects they are long and tapering, or vary widely in shape and size, as they do among the beetles.



VARIOUS FORMS OF ANTENNAE

Anthol'ogy, a collection of poems, epigrams or choice thoughts from various authors. The name, which means a *flower-gathering,* was given to early books of this sort compiled by the Greeks, and so came in time to be applied to all such works. The first Greek anthology was compiled by Meleager, a Syrian, about 80 B. C., and consisted largely of his own epigrams, although selections from other poets were introduced. There seems to have been no anthology of Latin writings in ancient times; at least none remains. But the various peoples of Asia, the Arabs, the Persians, the Turks, the Chinese, the Japanese and the people of India, have numerous anthologies, some of which are of a very early date.

An'thony, DANIEL READ (1824–1904), a famous Kansas pioneer and editor. His early years were spent in Rochester, New York. In 1854 he removed to Kansas, was lieutenant colonel in the Union army (1862–63), editor of the *Leavenworth Times* for forty years, mayor of Leavenworth from 1862 to 1872, member of the Kansas legislature in 1873, postmaster of Leavenworth from 1874 to 1885, and government director of the Union Pacific Railroad in 1886.

Anthony, SUSAN BROWNELL (1820–1906), an American reformer, born at Adams, Mass., of Quaker parents. She taught school for fifteen years, meanwhile becoming active in the temperance and anti-slavery movements, and in 1852 she organized the first state Women's Temperance Society. In 1868 she founded *The Revolution,* a periodical devoted to the advancement of women's rights, and in 1869 organized, with Mrs. Elizabeth Cady Stanton, the National Woman's Suffrage Association, of which she was president for many years prior to 1900. Miss Anthony was arrested, tried and fined in 1872 for attempting to vote, under the Fifteenth Amendment, in New York. As a lecturer and advocate she spoke to vast audiences in all parts of England and the United States, and she was a frequent contributor to magazines.

SUSAN B. ANTHONY

Anthracite, *an'thra site.* See COAL, subhead *Anthracite.*

An'thrax, a fatal disease to which cattle, horses, sheep and other animals are subject, always associated with the presence of an extremely minute micro-organism in the blood. It frequently assumes an epizootic form, and extends over large districts, affecting all classes of animals which are exposed to the exciting causes. It is also called splenic fever, and is communicable to man, appearing as carbuncle, malignant pustule or wool-sorter's disease. Thorough disinfection should follow every case. If the bodies of animals dying by anthrax are not burned, water and soil are liable to be contaminated, the poison to be carried by birds or flies, and the terrible disease communicated to human beings.

An'thropoid Ape. See APE.

Anthropol'ogy, the science of man and mankind, including the study of man's place in nature. It treats of him as animal, as a being endowed with a soul and of his relations to the rest of mankind. See ANATOMY; PHYSIOLOGY; PSYCHOLOGY; ETHNOLOGY.

Anthropom'etry, a system of measurement applied to human beings, of aid in classification and in the consideration of social, educational and physiological studies. During recent years anthropometry has come to be recognized as of great importance, and accurate systems have been devised which have become recognized throughout the country. This is especially true in criminology, in medicine and in physical culture.

An'tichrist, a term of biblical origin appearing in the *Epistles of Saint John* and referring to some person or institution standing in opposition to Christianity. The term means an opposer or adversary of Christ (See *I John* II, 18–22; IV, 1–3). Many Protestant writers have māde the pope or papacy antichrist, while other writers, both Catholic and Protestant, have regarded one or another of the persecuting emperors as antichrist.

Anti'cos'ti, an island of Canada, in the mouth of the Saint Lawrence, 135 miles long by 40 miles broad. The interior is mountainous and wooded, but there is much good land, and it is well adapted for agriculture. The fisheries, including trout, cod and herring, are valuable. The population is scanty.

An'tidote, a substance which will neutralize the effect of a poison. Acids are chemical antidotes to alkalis and alkalis to acids. Morphine and atropine are antidotes each for the other, because their actions upon the body are opposite. There are poisons for which no antidote is known. Many things besides the administering of an antidote should be done to relieve persons suffering from poisons (See the article POISON), but in the following list are given the names of many of the ordinary poisons, with the names of their antidotes and some means of counteracting injurious effects.

Alcohol: Use an emetic or stomach pump as quickly as possible; then give aromatic spirits of ammonia till the pulse is rapid and full; then apply heat to the extremities and cold to the head.

Ammonia: See *Caustic Potash.*

Arsenic: Give to the patient every half-hour for four doses, a tablespoonful of dialyzed iron, a substance which may be obtained at any drug store. Follow this treatment by a strong dose of castor oil.

Bedbug Poison: See *Corrosive Sublimate.*

Carbolic Acid: Give Epsom salts, the chemical name of which is magnesium sulphate, or any other soluble sulphate. At the same time give large amounts of sweet oil, whites of eggs and stimulants.

Carbonic Acid Gas: Give plenty of fresh air at once. If necessary, induce respiration artificially, as described in the article DROWNING. Give thirty drops of aromatic spirits of ammonia for three doses; and then every three hours for three doses, give an ounce of well diluted whisky.

Carbonic Oxide: See *Carbonic Acid Gas.*

Caustic Potash: Give diluted lemon juice, or mix two parts of vinegar with one of water and give with freedom; then give large amounts of sweet oil.

Chloral: Give the patient an emetic consisting of thirty grains of ipecac in water, and inject under the skin one-twentieth of a grain of strychnine. Apply warmth, induce artificial respiration (See DROWNING) and rub the body thoroughly to stimulate circulation.

Coal Gas: See *Carbonic Acid Gas.*

Cocaine: Lay the patient on his back and give whisky, with hypodermic injections of one-fortieth of a grain each of strychnine.

Corrosive Sublimate: Give an emetic of thirty grains of powdered ipecac in warm water at once; then give the whites of a dozen eggs and a hypodermic injection of morphine.

Knock-out Drops: See *Choral.*

Lye: See *Caustic Potash.*

Matches: See *Phosphorus.*

Morphine: See *Opium.*

Nicotine: Use emetics; give strong tea and stimulants, and then lay the patient flat on his back.

Nux Vomica: See *Strychnine.*

Opium: Empty the stomach as quickly as possible; cause the patient to inhale ammonia, and give him every hour a half grain of permanganate of potash. Induce artificial respiration (See DROWNING) and keep the patient awake; if necessary, shake him or even whip him severely about the body and the calves of the legs. Atropine injected under the skin, or tincture of belladonna given by the mouth, has a powerful effect in stimulating breathing.

Oxalic Acid: Chalk, whiting or even whitewash scraped from the wall should be given in quantities of water. Follow this by a dose of castor oil or Epsom salts.

Paris Green: See *Arsenic.*

Phenacetin: Give whisky and digitalis.

Phosphorus: Give an emetic promptly, and follow with a large quantity of mucilage from gum arabic; then give a strong dose of Epsom salts. Do not give fats or oils.

Rough-on-Rats: See *Phosphorus.*

Strychnine: Employ the stomach pump at once; give twenty grains of zinc sulphate or thirty grains of powdered ipecac as an emetic; then twenty grains of chloral and thirty grains of bromide of sodium dissolved together in two ounces of hot water should be injected into the rectum. Convulsions may be stopped by the use of chloroform. Twenty grains of sodium bromide should be given by the mouth every hour.

Sulphonal: Empty the stomach and use artificial respiration (See DROWNING). Give plenty of hot coffee as soon as possible.

Tansy: Give an emetic of thirty grains of ipecac in warm water, and follow with a dose of castor oil.

Turpentine: Give an emetic; then give plenty of mucilage from gum arabic, Epsom salts and finally a hypodermic injection of morphine.

Unknown Poison: Of course there can be no very intelligent treatment when the nature of the poison is unknown (See POISON). If the poison has been introduced by way of the mouth, use the stomach pump or an emetic. Induce artificial respiration if necessary (See DROWNING). Give two teaspoonfuls of chalk in water, four eggs beaten up with a glass of milk and some whisky.

Washing Soda: See *Caustic Potash.*

White Precipitate: See *Corrosive Sublimate.*

Antietam, *an tee'tam,* BATTLE OF, a battle in the Civil War, fought near Antietam Creek, a small stream in Maryland, fifty miles n. w. of Washington, September 16 and 17, 1862, between a Federal force of 75,000 under McClellan and a Confederate force of 40,000 under Lee. It was the crucial battle in Lee's first invasion of the North and, though technically a victory for neither party, compelled the Confederates to retreat. McClellan's principal lieutenants were Hooker, Sumner, Burnside, Sedgwick and Slocum; Lee's were A. P. Hill, D. H. Hill, "Stonewall" Jackson, Early, Stuart, Hood and Longstreet. More men were killed on the second day of the battle than on any other single day of the war. Military critics are agreed that Lee displayed generalship of a higher order during this battle than upon any other occasion, while McClellan made many tactical blunders. The result of the battle made possible the announcement of the Emancipation Proclamation and is considered by many, for that reason, the turning-point of the war.

An'ti-Fed'eralists, the name given to a political party in the United States at the beginning of the government, favoring the strict construction of the Constitution, states' rights and a weak central government. Its principal leader was Thomas Jefferson. The name of the party was later changed to Republican, Democratic-Republican, and finally Democratic. See DEMOCRATIC PARTY.

An'tigo, WIS., the county-seat of Langlade co., on the Chicago & Northwestern railroad, 96 mi. n. n. w. of Oshkosh. It has railroad shops, breweries, foundries and manufactures of wood and iron. Population in 1910, 7196.

Antig'one, in Greek mythology, the daughter of Oedipus and Jocasta, celebrated for her devotion to her father and to her brother Polynices, for burying whom, against the decree of King Creon, she suffered death. She is the heroine of Sophocles's *Oedipus at Colonus* and of his *Antigone.*

Antigua, *an te'gwah,* one of the British West Indies, the most important of the Leeward group. It was discovered by Columbus in 1493 and was settled by the British in 1632. Its shores are high and rocky; the surface is varied and fertile. The capital, Saint John, the residence of the governor of the Leeward Islands, stands on the shore of a well-sheltered harbor, in the northwest part of the island. The staple articles of export are sugar, molasses and rum. Population in 1901, 34,970.

Antilles, *an til'leez,* a name often applied to the West India Islands as a whole. They comprise two groups, known as the Greater Antilles and the Lesser Antilles. The Greater Antilles include Cuba, Jamaica, Haiti, Porto Rico and some small islands near their coasts. The Lesser Antilles are made up of small islands. Among the best-known of these are Trinidad, Barbadoes, Martinique, Antigua and Saint Thomas See WEST INDIES.

An'timo'ny, a brittle metal of a bluish-white or silver-white color. It melts at 842° F., and burns with a bluish-white flame. A mineral called stibnite or gray antimony is the chief ore from which the metal is obtained. It is found in many places, including Mexico, France, Spain, Hungary, Italy, Canada, Australia and Borneo. The metal does not rust or tarnish when exposed to the air. When alloyed with other metals it hardens them, and is therefore used in the manufacture of such things as Britannia-metal, type metal and pewter. It renders the sound of bells more clear; it makes tin more white and sonorous, as well as harder, and makes the types for printing firmer and smoother. The salts of antimony are very poisonous. Protoxide of antimony is the active base of tartar emetic and is regarded as a valuable remedy. *Yellow antimony* is a preparation of antimony of a deep yellow color, used in enamel and porcelain painting. It is of various tints and the brilliancy of the lighter hues is not affected by foul air.

An'tino'mianism (opposition to the law), the name given by Luther to the thought drawn by John Agricola from the doctrine of justification by faith, that the moral law is not binding on Christians as a rule of life. The term antinomian has since been applied to all doctrines and practices which seem to condemn or discountenance strict moral obligations. The Lutherans, on account of their doctrine of justification by faith. and the Calvinists, both on this ground and that of the doctrine of predestination, have been charged with antinomianism. but the charge is, of course, vigorously repelled by both.

Antinous, *an tin′o us,* a young Bithynian, favorite of the emperor Hadrian. He was drowned in the Nile in 122 A. D. Hadrian set no bounds to his grief. He gave Antinous's name to a newly discovered star, erected temples in his honor, called a city after him and caused him to be adored as a god throughout the empire. Statues, busts and bas-reliefs of him are numerous.

Antioch, *an′ti ok,* a famous city of ancient times, the capital of the Greek kings of Syria, on the left bank of the Orontes, about 21 mi. from the sea, in a beautiful and fertile plain. It was founded by Seleucus Nicator in 300 B. C., and named after his father Antiochus. In Roman times it was the seat of the Syrian governors and the center of a widely-extended commerce. It was called the "Queen of the East" and "The Beautiful" and was a center of Greek culture for a long period. Its population at the height of its power was estimated at 400,000. Antioch is frequently mentioned in the New Testament, and it was here that the disciples of Jesus Christ were first called Christians (*Acts* XI, 26). In the first half of the seventh century it was taken by the Saracens, and in 1098 by the Crusaders. In 1516 it passed into the hands of the Turks. The modern Antioch, or Antakiyeh, occupies but a small portion of the ancient site. Population, about 28,000.

Antioquia, *ahn′te o′keah,* a town of South America, in Colombia, in the State of Antioquia, on the River Cauca. It was founded in 1542. The town has considerable trade in maize and sugar. Population, about 9000.

Antipodes, *an tip′o deez,* a group of small, uninhabited islands in the South Pacific Ocean, s. e. of New Zealand. They receive their name from their position, which is nearly opposite to Great Britain.

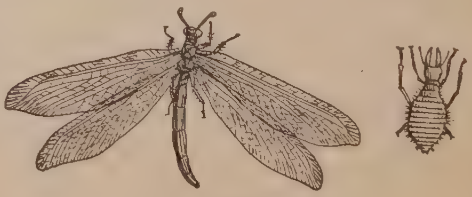
An′tipope, the name applied to those who at different periods have produced a schism in the Catholic Church by opposing the authority of the pope, under the pretense that they were themselves popes. The first antipope is reputed to be Laurentius, elected in 498 in opposition to Symmachus. Several emperors of Germany set up antipopes. After the death of Gregory XI, the French cardinals objected to the election of Urban VI and, withdrawing to Provence, set up Clement VII as antipope, thus creating in the Church what was known as the "great schism of the West." The last antipope was Felix V, a duke of Savoy (1439–1449).

An′tipy′rene, a white soluble powder, given often as a medicine to relieve pain. As it acts unfavorably upon the heart, it should not be taken except upon the advice of a physician, especially if the patient has a tendency to heart disease. Individuals vary in their susceptibility to the drug.

An′tisep′tic, an agent that prevents or stops decay. There are a great number of substances having this preservative property, among which are salt, alcohol, vegetable charcoal, creosote, corrosive sublimate, tannic acid, sulphurous acid, sulphuric ether, chloroform, arsenic, camphor, niter and aniline. Alcohol is used extensively in preserving specimens for museums and laboratories, and many of the poisonous substances mentioned above are satisfactory when the substance to be kept is not a food stuff. The packing of fish in ice and the curing of herring and other fish with salt are familiar antiseptic processes. The term is applied in a specific manner to that mode of treatment in surgery by which air is excluded from wounds, or allowed access only through substances capable of destroying the germs in the atmosphere. See BACTERIA AND BACTERIOLOGY; SURGERY.

An′titox′in, a substance formed by natural processes in the blood of persons suffering from bacterial diseases. It possesses the power of neutralizing the poisons or toxins developed by the bacteria. It is the presence of antitoxins in the serum of the blood that frequently makes inoculation a preventive in bacterial diseases. See SERUM THERAPY; BACTERIA AND BACTERIOLOGY.

Ant′-li′on, the larva of an insect which in its perfect state resembles a small dragon fly It is remarkable on account of the ingenious method by which it catches the ants and other insects on which it feeds. The ant-lion digs a funnel-shaped hole in the dryest, finest sand it can find and makes the sides smooth and sloping. Then it buries itself at the bottom of the hole with only its strong jaws visible. When some luckless ant stumbles over the edge of the hole, it rolls down the sloping sides, to be


ANT-LION
Perfect insect and larva.

seized by the voracious larva in waiting. As soon as the juices are sucked from the body of the prey, the ant-lion jerks it out of the hole, repairs the sides of the pit and is ready for another insect. If at any time the prey seems liable to escape up the sloping sides, the ant-lion washes it back by throwing sand over it.

Antofagasta, *ahn'to fa gah'sta,* a seaport of Chile, situated on the Pacific coast, about 500 mi. n. of Valparaiso. It is an important shipping port for saltpeter, large deposits of which are near-by, and is connected by railroad with valuable silver mines. This city and the province of which it is the capital were ceded to Chile by Bolivia in 1882. Population in 1900, 19,482.

Antonelli, *ahn'to nel'le,* Giacomo (1808–1876), an Italian cardinal, born at Sonnino. He early became conspicuous for his intellectual ability, and was for a time attached to the suite of Pope Gregory. In 1841 he was made under-secretary of the ministry of the interior, and four years later became minister of finance. He acquired a great influence during the reign of Pius IX, and in 1847 was made cardinal and also a member of the ministerial council. The following year he became prime minister. He exerted his influence to maintain the national supremacy of Italy and at first disagreed with the pope concerning a war with Austria. After the pope was returned to power through the influence of France, Antonelli took a leading part in reorganizing the government. He was opposed to all advances from other powers and to the desire of the Italians for a national organization. He died while holding the position of prime minister to the pope.

An'toni'nus Pius, (86–161 A. D.), Roman emperor, selected by Hadrian as his successor. The persecutions of the Christians he speedily abolished. In Britain he extended the Roman dominion, and by raising a new wall put a stop to the invasions of the Picts and Scots. He was succeeded by Marcus Aurelius, his adopted son.

An'tony, Mark (Marcus Antonius) (83–30 B. C.), a Roman triumvir. He served in Gaul under Caesar and in 50 B. C. returned to Rome to support Caesar's interests against Pompey. When the war broke out between these two, Antony led reënforcements to Caesar in Greece and took an important part in the battle of Pharsalia. In 44 B. C., as Caesar's colleague in the consulship, he tried to have Caesar made emperor (See Caesar, Caius Julius). After Caesar's assassination, Antony, by the oration which he delivered over the body, excited the people to anger and revenge and compelled the assassins to flee. Antony quarreled with Octavianus, but became reconciled to him and departed to Cisalpine Gaul, which had been conferred upon him against the will of the senate. While he was absent he was declared a public enemy, was defeated by the army of the senate and was compelled to flee over the Alps. Later, through the influence of Lepidus, Antony and Octavianus were again reconciled, and it was agreed that the three conspirators, who were called *triumvirs,* should divide the Roman world among them. Antony received Gaul; Lepidus, Spain, and Octavianus, Africa and Sicily.

MARK ANTONY

In 42 B. C. Antony and Octavianus defeated Brutus and Cassius at Philippi, and Antony then went to Asia. Here Cleopatra appeared before him to apologize for her insolent behavior to the triumvirs. Antony fell a victim to her charms and followed her to Alexandria. Hostilities which broke out in Italy between his own relatives and Octavianus recalled him to Italy, but the struggle was decided before he reached Rome. A new division of the Roman world was now made, by which Antony obtained the East and Octavianus the West. Antony returned again to Cleopatra, and some time later war was declared by Octavianus, ostensibly against Cleopatra, but really against Antony. At the battle of Actium, Antony was defeated (See Actium). He returned to Alexandria and, deceived by a false report of Cleopatra's death, fell upon his own sword.

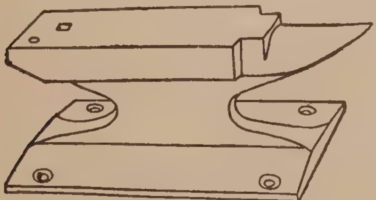
Ant'werp, the chief port of Belgium and the capital of the province of Antwerp, on the Scheldt, about 50 mi. from the open sea. It is strongly fortified, being completely surrounded on the land side by a semi-circular inner line of fortifications, the defenses being completed by an outer line of forts and outworks. The cathedral, with a spire 400 feet high, one of the largest and most beautiful specimens of Gothic architecture in Belgium, contains Rubens's celebrated masterpieces—the *Descent from the Cross,* the *Elevation of the Cross* and *The*

Assumption. The other churches of note are Saint James's, Saint Andrew's and Saint Paul's, all enriched with paintings by Rubens, Vandyck and other masters. The harbor is large and one of the finest in the world. The shipping trade has greatly advanced in recent years, and is now very large. There are numerous and varied industries, among which are sugar refining, distilling, lace-making and ship-building. The foreign trade is extensive, and through this port nearly all the commerce of Belgium passes. Population in 1900, 285,600.

Anu'bis, one of the deities of the ancient Egyptians, the son of Osiris by Isis. His office was to conduct the souls of the dead from this world to the next.

ANUBIS

An'vil, an iron or steel block on which pieces of metal are laid for the purpose of being hammered. The common smith's anvil is generally of seven parts, namely, the *core* or *body*; the four corners for the purpose of enlarging its base; the projecting end, which contains a square hole for the reception of a set or chisel to cut off pieces of iron; and the *beak* or conical end, used for turning pieces of iron into a circular form. These parts are each separately welded to the core and hammered so as to form a regular surface with the whole. When the anvil has received its final form, it is faced with steel, and is then tempered in cold water.



ANVIL

Aor'ta, the great artery, the trunk of the arterial system. It rises from the left ventricle of the heart toward the top of the breast-bone; then makes a curve, called the *arch of the aorta*, whence it gives off branches to the head and upper extremities; then going downward through the chest, it gives off branches to the trunk, thence it passes through the diaphragm and finally divides into the two iliacs, which supply the pelvis and lower extremities. See ARTERIES; CIRCULATION; HEART.

Apache, *a pah'cha,* a warlike tribe of indians inhabiting Arizona, New Mexico and the northern states of Mexico. Ages ago they migrated from the vicinity of the Great Slave Lake in Canada, and are now the veritable Ishmaels of the West. For years they carried on a guerrilla warfare with settlers and troops. Their leader, Geronimo, was captured by General Miles and, with other hostile indians, kept as a prisoner. Civilization is slowly benefiting the Apache on the San Carlos and White Mountain reservations in Arizona. One highly educated indian, Antonio Apache, was one of the officials of the department of anthropology at the World's Columbian Exposition in Chicago, 1893. In 1900 there were about 5000 of the tribe remaining. They are skillful in the manufacture of baskets and pottery.

APACHE

Ap'atite, a translucent but seldom transparent mineral, a compound of phosphate of lime with fluoride and chloride of calcium. It occurs principally in the oldest rocks and in veins, extensive deposits being found in all parts of the world. It is now largely utilized as a source of artificial phosphate for fertilizers.

Ape, a name commonly given to any of the family of mammals to which the monkey belongs. The term is limited, strictly, to the *anthropoid*, or man-like monkeys. This family includes the chimpanzee, the gorilla, the orang-outang and the gibbon, some of which are larger and stronger than man. The skeleton closely resembles that in man, the difference being mostly in the proportion of the limbs, the shape of the cranial and facial bones and the spinal column. The legs are shorter than in man, the arms longer, the skull thicker, the jaws square rather than rounded and the spinal column not curved at the base. The feet are similar to those of man, though the big toe is somewhat like a thumb, and the foot can clasp things like a hand. The brain is only half as large as man's, but is similar in almost all other respects. In muscles, nerves and all the bodily organs, man and the apes are practically the same. But the bodies of the apes, excepting the face, the palms of the hands and the soles of the feet, are covered with coarse black or brown hair. The food of the ape is vegetable, largely fruits, and its home is built on a rude platform constructed in the trees of the tropical forests. See CHIMPANZEE; GORILLA; ORANG-OUTANG; GIBBON; BABOON; MONKEY.

Apelles, *a pel'leez,* the most famous of the painters of ancient Greece and of antiquity, was born in the fourth century B. C., probably at Colophon. Ephorus of Ephesus was his first teacher, but, attracted by the renown of the Sicyonian school, Apelles later went to Sicyon to study. In the time of Philip he went to Macedonia and there a close friendship between him and Alexander the Great was established. His portrait of Alexander with a thunderbolt in his hand was one of his most celebrated paintings. His drawings are especially noted for accuracy in detail and delicacy of coloring. Lucian's detailed description of Apelles's works gave inspiration to the Italian Botticelli, the German Durer and many other artists.

Ap'ennines, THE, a prolongation of the Alps, forming the "backbone of Italy," are perhaps the most recently formed mountains in Italy. The average height of the mountains composing the range is about 4000 feet, and nowhere do they reach the limits of perpetual snow, though some summits exceed 9000 feet in height. Monte Corno, the highest peak, has an altitude of 9580 feet. On the highest summit of the Northern Apennines, Monte Cimone (7110 feet) is a meteorological observatory. These mountains consist almost entirely of limestone rocks, and are exceedingly rich in the finest marbles. On the south slopes volcanic masses are not uncommon, Mount Vesuvius, the only active volcano on the continent of Europe, being an instance. The lower slopes are well clothed with vegetation; the summits are sterile and bare. Thirteen passes pierce the Apennines.

Aphasia, *a fa'zhe a,* a symptom of certain diseases of the nervous system, in which the patient loses the power of expressing ideas by means of words, or loses the appropriate use of words, the vocal organs the while remaining intact and the intelligence sound. There is sometimes an entire loss of words as connected with ideas, and sometimes the loss of a few only. In one form of the disease, called *aphemia,* the patient can think and write but cannot speak; in another, called *agraphia,* he can think and speak, but cannot express his ideas in writing. In a great majority of cases, where post-mortem examinations have been made, morbid changes have been found in the left frontal convolution of the brain.

Aphides, *af'i deez,* very small greenish or brown bugs, commonly known as *plant lice,* that live on the tender shoots of plants, sucking the sap through long, sharp beaks. Some of them have two minute tubes on their backs from which they excrete a sweet substance that ants and other insects like (See ANT). Aphides are injurious to plants and often become great pests.

Aphrodite, *af'ro di'te,* the goddess of love among the Greeks. See VENUS.

Aphthae, *af'the,* a disease. See THRUSH.

A'pia, the chief place and trading center of the Samoan Islands, on the north side of the island of Upolu. It was the scene of a terrible disaster to the American and German navies during a hurricane in March, 1889. Population, about 3750. See SAMOA.

A'piary, a place for keeping bees. The apiary should be well sheltered from strong winds, moisture, and the extremes of heat and cold. The hives should face the south or southeast, and should be placed on shelves two feet above the ground and about the same distance from each other. As to the form of the hives, and the materials of which they should be constructed, there are great differences of opinion. Wooden hives of square, box-like form are now gaining general favor among bee keepers. They usually consist of a large breeding chamber below, and two sliding removable boxes called *supers* above, for the withdrawal of honey without disturbing the contents of the main chamber It is of great importance that the apiary should be situated in the neighborhood of good feeding grounds, such as gardens, clover fields, or heath-covered hills. When their stores of honey are removed the bees must be fed during the winter and part of spring with syrup or with a solution consisting of two pounds of loaf sugar to a pint of water. See BEE.

A'pis, a bull to which divine honors were paid by the ancient Egyptians, who regarded him as a symbol of Osiris. He was not suffered to live beyond twenty-five years, but was secretly drowned by the priests in a sacred well. Another bull with the sacred marks was selected in his place, often only after a long search. His birthday was annually celebrated, and his death was followed by a season of public mourning.

Apoc′alypse, the name frequently given to the last book of the New Testament, in the English version called the *Revelation of Saint John the Divine.* It is generally believed that the Apocalypse was written by the apostle John in his old age (95–97 A. D.), in the Isle of Patmos, whither he had been banished by the Roman emperor Domitian.

Apoc′alyp′tic Number. In *Revelation* XIII, an account is given of the beast with seven heads and ten horns that deceives and oppresses mankind. The writer of the chapter, fearing to mention the name, probably of a Roman emperor whom he feared, speaks of him in this manner: "Let him that hath understanding count the number of the beast: for it is the number of a man; and his number is Six hundred three score and six." Many interpretations of this number have been made, but the most favored explanaation finds in the corresponding letters of the Hebrew numerical alphabet the name of Nero.

Apocrypha, *a pok′ri fah,* a term applied in the earliest churches to various sacred or professedly inspired writings. The term is specially applied to the following books, which were written during the two centuries preceding the birth of Christ: The first and second books of Esdras, Tobit, Judith, the rest of the book of Esther, the Wisdom of Solomon, the Wisdom of Jesus the son of Sirach, or Ecclesiasticus, Baruch the Prophet, the Song of the Three Children, Susanna and the Elders, Bel and the Dragon, the Prayer of Manasses and the first and second books of Maccabees.

APOLLO WITH LYRE AND GRIFFIN, VATICAN, ROME

Apol′lo, son of Jupiter and Leto, and twin brother of Diana. He slew the serpent Python on the fifth day after his birth and afterward, with Diana, he killed the children of Niobe. He also destroyed the Cyclops, because they forged the thunderbolts with which Jupiter killed Aesculapius, Apollo's son. Apollo was originally the sun god, and in later times the view was almost universal that Apollo and Helios were identical. From being the god of light and purity in a physical sense, he gradually became the god of spiritual light and purity and of political progress. He came to be regarded as the god of song and prophecy, the institutor and guardian of civil and political order and the founder of cities. His worship was introduced at Rome, probably in the time of the Tarquins. Among the ancient statues of Apollo that have come down to us the most remarkable is the one called the *Apollo Belvedere,* from the Belvedere Gallery in the Vatican at Rome.

Ap′ollo′nius of Tyre, the hero of a tale of adventure which had an immense popularity in the Middle Ages and which furnished the plot of Shakespeare's *Pericles, Prince of Tyre.* The story, originally in Greek, first appeared in the third century after Christ.

Ap′oplexy, the sudden loss of consciousness and voluntary motion caused by pressure upon the brain resulting from congestion or rupture of the blood vessels in that organ. In a complete apoplexy the person falls suddenly, is unable to move his limbs or to speak, and gives no evidence of seeing, hearing or feeling. His breathing is stertorous, much like that of a person in deep sleep. Among the premonitory symptoms of this disease are drowsiness, giddiness, dullness of hearing, frequent yawning, disordered vision, noise in the ears and vertigo. It is most frequent between the ages of fifty and seventy. People with large heads, short necks, full chests and corpulent frames are generally considered to be more liable to apoplexy than persons of thin habit. Among the common predisposing causes are long and intense thought, continued anxiety habitual indulgence of the temper and passions, sedentary and luxurious living, intoxication. More or less complete recovery from a first and second attack is common, but a third is almost invariably fatal.

A Poste′rio′ri. See A Priori and A Posteriori.

Apos′tles, twelve men whom Jesus selected to attend him during his ministry and to promulgate his religion. They were Simon Peter, and Andrew, his brother; James, and John, his brother, sons of Zebedee; Philip; Bartholomew;

Thomas; Matthew; James, the son of Alpheus; Lebeus, his brother, called *Judas*; Simon, the Canaanite, and Judas Iscariot. All were laboring men except Matthew, who was a tax collector. To these were subsequently added Matthias, (chosen by lot in place of Judas Iscariot) and Paul. The Bible gives the name of apostle to Barnabas also, who accompanied Paul on his missions (*Acts* XIV, 14). In a wider sense the term apostles is applied to those preachers who first taught Christianity in heathen countries, for example, Saint Denis, the apostle of the Gauls; Saint Boniface, the apostle of Germany; Saint Augustine, the apostle of England.

Apostles' Creed. See CREED.

Ap′ostol′ic Succession, the doctrine according to which bishops, priests, deacons and other similar officers of the Church are believed to have received consecration from those who trace their right back to Christ's Apostles, in direct line of succession. This system is strictly observed by the Roman Catholic, the Eastern and the Anglican churches, who consider no minister legitimate unless he has been ordained by a bishop claiming this succession from the Apostles. See BISHOP.

Apoth′ecaries' Weight, the weight used in dispensing drugs, in which the pound is divided into 12 ounces, the ounce into 8 drams, the dram into 3 scruples and the scruple into 20 grains, the grain being equivalent to that in avoirdupois weight.

Apoth′ecary, Druggist or **Pharmacist,** in a general sense, one who keeps a shop or laboratory for preparing, compounding and selling medicines, and for the making up of medical prescriptions. It was in Africa that physicians first began to give up to ingenious men the preparation of medicines from prescriptions. It is probable, therefore, that many Arabic terms of the art were by these means introduced in pharmacy and chemistry, and have been still retained and adopted. In the United States one who keeps a drugstore is usually called a *druggist,* while the term *pharmacist* is applied to one who has completed a course in pharmacy and is licensed to compound medicines from physicians' prescriptions.

Ap′otheo′sis (deification), a solemnity among the ancients by which a mortal was raised to the rank of the gods. The custom of placing among the gods those mortals who had rendered their countrymen important services was very ancient among the Greeks. The Romans, for several centuries, deified none but Romulus, and first imitated the Greeks in the fashion of frequent apotheosis after the time of Caesar. From this period apotheosis was regulated by the decrees of the senate and accompanied with great solemnities. Many of the Roman emperors were deified.

Ap′pala′chian Mountains, also called Alleghanies, a vast mountain range in North America extending for 1300 miles from Cape Gaspé, on the Gulf of Saint Lawrence, southwest to Alabama. The system has been divided into three great sections: the northern, including the Adirondacks, the Green Mountains and the White Mountains, from Cape Gaspé to New York; the central, including a large portion of the Blue Ridge, the Alleghanies proper and numerous lesser ranges, from New York to the valley of the New River; and the southern, including the continuation of the Blue Ridge, the Black Mountains and the Smoky Mountains, from the New River southward. The chain consists of several ranges generally parallel to one another, the altitude of the individual mountains increasing on approaching the south. The highest points are Mount Mitchell in North Carolina, 6688 feet, and Mount Washington in New Hampshire, 6293 feet high. Lake Champlain is the only lake of great importance in the system, but numerous rivers of considerable size take their rise here. Magnetite, hematite and other iron ores occur in great abundance, and the coal deposits are among the most extensive in the world. Marble, limestone, fire-clay, gypsum and salt abound. The forests, covering many of the ranges, yield large quantities of valuable timber. See ADIRONDACK MOUNTAINS; BLUE RIDGE; CUMBERLAND MOUNTAINS.

Ap′palach′ico′la or **Apalachicola,** a river of the United States, formed by the Chattahoochee and Flint rivers, which unite near the northern border of Florida. It flows south through Florida for 100 miles, emptying into Appalachicola Bay in the Gulf of Mexico. It is navigable throughout.

Appeal, in law, the removal of a suit from a lower to a higher court for rehearing, or for a reversal of the decision. Each system of courts has particular rules upon which appeals may be granted, usually requiring the presentation of additional material evidence, or the certification of an error in the conduct of the trial by the court. See PROCEDURE.

Appendicitis, *ap pen′di si′tis,* an inflammation of the vermiform appendix, formerly thought to be an inflammation of the large intestine. The vermiform appendix is an organ about three inches long and a quarter of an inch in diameter in its normal condition, and is located on the right side of the abdomen midway between the crest of the ilium and the navel, though its position varies somewhat in different individuals. The organ seems now to be useless, though the more highly developed corresponding organ in some of the lower animals is of value in digestion. More than half of the cases of appendicitis appear between the ages of twenty and fifty, and about eighty per cent of the patients are males.

Appendicitis may arise from a variety of causes, such as wounds, strains or violent injury, or the presence of some foreign body in the appendix. The last mentioned cause, once thought to be the most important, is now considered to be rarely the exciting cause. It is probable that in a majority of cases the prime factors are bacteria acting upon an injured or weakened mucous membrane. Among the symptoms of appendicitis are sharp, colic-like pains, varied by dull aches, which gradually localize themselves in the region of the appendix. Fever follows rapidly, and is usually accompanied by nausea and vomiting. A large proportion of all cases recover, but in severe cases the tissue of the appendix ulcerates and becomes perforated, causing inflammation of the whole abdominal cavity. In cases of perforation death is almost certain to follow, unless prompt surgical measures are taken. In fact, the surgical operation has come to be considered the only certain cure for the disease, and so well known are the method of operation and the subsequent treatment of the wound, that the operation is not regarded in the least as a difficult or dangerous one.

Ap′percep′tion, in psychology, the term employed to denote the assimilation of ideas. When a new idea is presented to us, we attempt to relate it to our store of knowledge. In this attempt the mind reacts upon the idea presented to it; therefore apperception is a reaction of our mental activities upon external stimuli. The degree of effort accompanying the reaction depends upon the nature of the idea. If it is of little importance and closely related to something already well understood, the effort of apperception is so slight that we scarcely recognize it, or we may be entirely unconscious of it, as in the apperception of an apple or a ball; but if the idea is new, we bring to bear upon it all our mental powers. All similar ideas are brought into consciousness and compared with the new one, which is then classified, and if found to agree with the ideas already in the mind, is accepted. If found to disagree, it may be rejected or held in abeyance for further examination. Before a new idea can be apperceived, we must obtain knowledge concerning it. If it is a new sort of fruit, we bring to bear upon it all the senses, such as sight, touch, taste, smell. We then attempt to learn of its manner of growth, whether the plant is annual, biennial or perennial; whether it is an herb, shrub or tree, and whether it thrives in a warm or temperate climate. When these items of information are obtained, we are prepared to classify properly the new specimen and add it to our idea of fruit.

Those ideas which affect our notions of life, such as political, social and religious truths and principles, are received with greater difficulty than ideas of material objects. This is because their reception tends to modify our settled beliefs or accustomed practices, and when they are first presented we array against them all of our habits and customs which they affect. Because of their wide influence we are often a long time in apperceiving new truths of this sort. However, this is not wholly to our disadvantage, since ideas that are apperceived slowly become thoroughly assimilated and exert a strong influence upon life.

Apperception is a fundamental educational doctrine and is generally accepted by the educators of Germany and the United States. It lies at the foundation of the following truths which should be remembered in connection with all teaching.

(1) When ideas are presented, the memory of past similar ideas will exert a modifying influence, and the tendency is to interpret the new idea by the old ideas which first come into consciousness. Each one interprets new ideas in the light of his experience. The artist sees in a landscape material for a beautiful picture, while the farmer sees in the same landscape so much fertile soil suitable for cultivation.

(2) The teacher needs to know the child's previous history before she can tell how he will receive certain ideas, especially those affecting his moral and social life.

(3) The tendency of the mind to grow into fixed attitudes makes apperception of new truths more difficult as one becomes older.

(4) For the above reason the habits and views of life formed in childhood and youth are very important, because they influence one for all future time.

APPLE ORCHARD

See Association of Ideas; Interest; Perception. Consult Rooper's *Apperception, or a Pot of Green Feathers;* De Garmo's *Essentials of Method,* and Lange's *Apperception.*

Ap'petite, a word generally applied to the desire for food. A healthy appetite is favored by work, exercise, plain living and cheerfulness; absence of this feeling, or defective appetite, indicates a diseased action of the stomach, of the nervous system or of circulation, or it may result from bad habits. Depraved appetite, or a desire for unnatural food, as chalk, ashes, dirt and soap, depends often, in the case of children, on bad habits or tastes; in the case of adults it may indicate dyspepsia. Continual hunger, when it occurs in childhood, generally indicates the presence of worms; in adults it is caused by bad habits and indigestion, the gnawing pains of disease being mistaken for hunger.

Ap'pian Way, called the Queen of Roads, the oldest and most renowned Roman road, was constructed during the censorship of Appius Claudius Caecus, 313 B. C. It was built with large square stones on a raised platform and led direct from the gates of Rome to Capua, in Campania. It was afterward extended through Samnium and Apulia to Brundusium, the modern Brindisi. In 1850–1853, in the reign of Pius IX, it was excavated as far as the eleventh milestone from Rome. Even at the present day the road is in excellent condition. It commands a beautiful prospect, embracing the Campagna, the ruins of the aqueducts and the mountains, while on both sides of the road are numerous ancient tombs, the most remarkable of which are those of the Scipios and Caecilia Metella.

Ap'pius, Claud'ius, Cras'sus, one of the Roman decemvirs appointed in 451 B. C. to draw up a new code of laws. He and his colleagues plotted to retain their power permanently, and at the expiration of their year of office they refused to give up their authority. The people were incensed against them, and the following circumstances led to their overthrow: Appius Claudius had conceived a passion for Virginia, the daughter of Lucius Virginius, then absent with the army. At the instigation of Appius, Marcus Claudius, one of his clients, claimed Virginia as the daughter of one of his own slaves, and the decemvir, ordered that until the question was decided she should remain in the custody of the claimant. Virginius, hastily summoned from the army, appeared with his daughter next day in the Forum and appealed to the people; but Appius Claudius again adjudged her to Marcus Claudius. Unable to rescue his daughter, the father stabbed her to the heart. The decemvirs were deposed by the indignant people, 449 B. C., and Appius Claudius died in prison or was strangled.

Ap'ple, the fruit of a well-known tree of the rose family; also the tree itself. The apple belongs to the temperate regions, over which it is almost universally cultivated. It reaches a moderate height and has spreading branches. The leaves are nearly oval, and the flowers are pinkish white and produced from very short shoots or spurs, which are usually of two years' growth. The apple is probably a native of southwestern Asia and southern Europe. It was known to the Romans, by whom it was introduced into England. From England it was introduced into the United States, and now North America leads the world in the production of apples.

All of the numerous varieties have been derived from two species, the wild crab and the common apple. The fruit is a rather hard, juicy pulp that is formed around a core, which consists of five cells bearing two seeds each. The pulp is white or slightly pinkish. Most apples are nearly round, though some are elongated. In color there are nearly as many shades as there are varieties, though these shades are limited to red, green and yellow. Several thousand varieties of cultivated apples are known and about 1000 are grown in the United States, though of this number not more than 100 are profitable, and not over twenty varieties are successful in any one locality. The numerous varieties are adapted to the soil and climate of widely different sections, and if removed from their native locality will seldom succeed. For instance, those which are the most profitable in the northern part of the United States, as New England, New York and Michigan, will not thrive as far south as the Ohio River, while the varieties accustomed to the warmer climate of southern Illinois and Missouri fail when removed to Michigan or New England. In general, the warmer apple-growing regions succeed best with the early fruit, while the colder regions, such as New England, Michigan and northern New York, produce the best late fruit, or those varieties known as winter apples.

Apples are used in many ways. The choicest fruit is eaten raw, or it may be cooked by a dozen methods. Inferior grades are canned, evaporated or made into cider, which in turn is made into vinegar (See Cider; Vinegar).

By placing winter apples in cold storage or even in cool cellars, the fruit can be kept in good condition through the winter months and until the earliest varieties which are raised in the warmer regions are on the market, so that it is possible to have apples the entire year. The apple is the most valuable fruit of the temperate climates and is generally considered the most valuable in the world.

New varieties are obtained by planting the seed, but a desirable variety is seldom secured in this way, because the seeds do not reproduce the fruit from which they were taken; therefore orchard trees are prepared by grafting (See GRAFTING). In setting trees, the ground should be carefully prepared. The best results are secured by setting the trees in rows about thirty feet apart each way. To insure a good crop the land should be tilled until about the middle of July, then sown with some cover crop, like clover or cowpeas. This stops the growth of the trees and enables the fruit to mature more satisfactorily. Trees vary greatly in production, but under the best of conditions one has been known to produce from eighteen to twenty barrels of fruit in a season. The largest orchards cover thousands of acres. The states having the largest number of trees in 1900, in the order of their importance, were Missouri, Illinois, Ohio, Kansas and Pennsylvania. In the order of production the leading states were New York, Pennsylvania, Ohio, Virginia and Illinois, thus showing that the states having the largest number of trees do not necessarily produce the largest quantity of fruit. This difference is due to the fact that in many states the orchards were young and not bearing. There are in the United States upwards of 200,000,000 apple trees, and the yearly crop of apples amounts to about 100,000,000 barrels. Most of these are used at home, although considerable quantities are exported to other countries.

Apple of Discord, according to the story in Greek mythology, the golden apple thrown into an assembly of the gods by the goddess of discord. It bore the inscription "For the fairest," and Juno, Venus and Minerva all claimed it at once. Paris, chosen as judge, gave the apple to Venus, and this decision so inflamed the jealousy and hatred of Juno toward all of the Trojan race, that she did not cease her plots against it until Troy was destroyed. See PARIS.

Apples, SEEDLESS, one of the latest achievements in the cultivation of this common fruit. After several years of experimenting, Mr. John F. Spencer of Grand Junction, Col., succeeded in growing several trees that bore seedless and coreless apples. The fruit from these trees had a beautiful dark red color, with yellow, strawberry-like dots. It was of goodly size and had a flavor somewhat resembling a wine-sap. The meat was solid, with a slight hardened substance near the blossom end, like the navel in the seedless orange. The trees were quite hardy and had a smooth bark. An important feature of this seedless variety is the blossomless tree. There is a stamen and a very small quantity of pollen, but the rest of the flower is missing. This absence of the blossom leaves no place for the codling moth to lay its eggs, so that wormless apples are practically assured. The lack of the flower also removes the danger from late frosts. Many trees were at once grafted from the original few. The desirable features of the seedless apple would seem to indicate that it may in time displace all the old seed-bearing varieties.

Ap′pleton, WIS., the county-seat of Outagamie co., 100 mi. n w. of Milwaukee, on the Fox River and on the Chicago & Northwestern and the Chicago, Milwaukee & Saint Paul railroads. The city lies on a plateau 70 feet above the river and near the Grand Chute falls, which furnish water power for various manufactures. The principal products include paper, farm implements, furniture, flour and woolen and knit goods. It is the seat of Appleton Collegiate Institute and Lawrence University (Methodist Episcopal). The place was settled in 1840 and incorporated as a city in 1857. Population in 1910, 16,773.

Ap′pomat′tox Court House, a village in Virginia, situated 25 mi e. of Lynchburg. It was at this point that General Lee surrendered the army of Northern Virginia to General Grant on April 9, 1865. This surrender virtually ended the Civil War. The articles of capitulation were signed in the McLean house, a large residence near the village. See CIVIL WAR IN THE UNITED STATES.

A′pricot, a fruit of the plum genus, closely resembling the peach in appearance. It is a native of Armenia and other parts of Asia, and also of Africa. The apricot is a low tree, of rather crooked growth, with somewhat heart-shaped leaves. The fruit is sweet, more or less juicy, of a yellowish color, about two-thirds the size of the peach and resembling it in delicacy of flavor. It is one of the most highly esteemed fruits of the temperate climates. Apricots are raised in great quantities in southern Europe and in California, which state has more than 4,500,000 trees. A portion of the crop is canned for market.

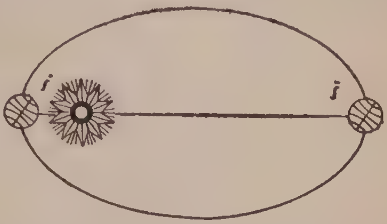
A'pril, the fourth month of the year. A curious custom prevails of playing jokes, or "making fools" of people, on the first day of this month. In the United States the person so imposed upon is called an "April fool"; in France, an "April fish." The custom has been connected with the miracle plays of the Middle Ages, in which Christ was represented as having been sent at this season of the year from Annas to Caiaphas and from Pilate to Herod.

A Prio'ri and A Poste'rio'ri, in logic, Latin words which are applied, respectively, to innate ideas, or knowledge that the mind possesses independently of experience, and to those ideas which are obtained from observation and experiment. *A priori* knowledge is often referred to as intuitive knowledge. For instance, the proposition, "Infinity comprises all that is," expresses a self-evident truth and is therefore *a priori* knowledge; whereas the proposition, "Happiness depends on virtuous living", is established by inference from many examples of virtuous lives, and is an *a posteriori* truth.

In logic, *a priori* arguments are those in which a conclusion is drawn from general principles that are necessary truths, while an *a posteriori* argument is an inference of a law or fact from effects which the law or fact has produced. These two forms of reasoning are explained respectively under Deductive Method and Inductive Method.

Apse, in architecture, the term applied to the projecting semicircular portion of a building, roofed over separately by an arched vault or semidome, which most commonly appears at the eastern end of the choir or chancel of a church. As the apse was considered the most holy part of the early church, rich decorations were lavished upon it. The exterior was sometimes square or octagonal, but even then the interior was semicircular. In later churches the central apse was flanked by smaller ones, called *apsidoles*, which terminated the aisles.

Apsides, *ap'si deez* (singular, *apsis*), in astronomy the two points of the orbit of a heavenly body, situated at the extremities of the major axis of the ellipse formed by the orbit, one of the points being that at which the body is at its greatest, the other that at which it is at its least, distance from the body about which it revolves. In the accompanying diagram, *i i* show the apsides. The earth and the other planets, as they revolve about the sun and reach these two points respectively, are said to be in *aphelion* and *perihelion*; and the moon in revolving about the earth is in *apogee* and *perigee*. The line connecting the apsides, which is really the major axis of the orbit, is called the line of the apsides, and this has a slow, angular motion in the plane of the planet's orbit. In all the planets excepting Venus, this motion is forward. See Anomalistic Year.



Ap'teryx, a small bird belonging to the same family as the ostrich and living in New Zealand. It is a shy, nocturnal bird, feeding on worms, insects and seeds, and is totally wingless and tailless. But few of such birds remain in existence.

APTERYX

A'qua For'tis, (strong water), a common name for nitric acid. See Nitric Acid.

Aquamarine, *a'qua ma reen'*, a name given to some of the finest varieties of beryl, of a sea green or blue color. The name is also applied to varieties of topaz. The aquamarine is of less value than the ruby or sapphire.

Aqua Re'gia. See Nitric Acid.

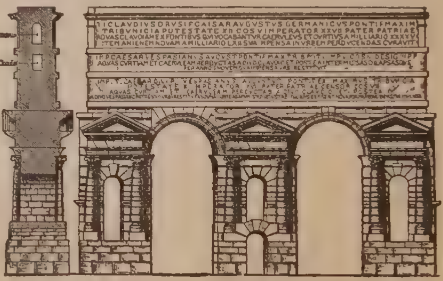
Aqua'rium, a vessel constructed wholly or partly of glass, and containing salt or fresh water, in which are kept living specimens of marine or fresh-water animals, along with aquatic plants. In principle the aquarium depends on the relations of animal and vegetable life; animals consuming oxygen and exhaling carbonic acid, plants reversing the process by absorbing carbonic acid and giving out oxygen. The aquarium must consequently be stocked both with plants and animals, and for the welfare of both, something like a proper proportion should exist between them. The simplest form of aquarium is that of a glass vase; but aquariums on a larger scale consist of a tank or a number of tanks with plate-glass sides and stone floors, and contain sand and gravel, rocks and seaweed. By improved arrangements, light is admitted from above, passing through the water in the tanks and illuminating their contents. Aquariums on a large scale have been constructed in connection with public parks or gardens, and the name is also given to places of public entertainment in which large aquariums are exhibited. The largest aquarium in the world is at Castle Garden, N. Y. It contains 150 tanks for smaller fish, and a number of gigantic tanks for sharks and other large and dangerous fish. The aquarium of the American Fish Commission at Washington is also important, since it contains many specimens of our best food fishes. Among foreign aquariums, those at the Naples Marine Station, Paris, Hamburg, Saint Petersburg and Brighton, Eng., are the most important.

Aqua′rius (the water bearer), the name of a constellation, and the eleventh sign of the zodiac. The symbol was ♒ (running water), and the name Aquarius was given because of the rains that fell so plentifully in Italy during that season. The sun moves in this sign during parts of January and February.

Aquat′ic Plants, a general name applied to any plants which live either wholly or partly in water. Some of these plants are rooted in the ground and grow through the water, raising their leaves and blossoms above the surface. The leaves of some of these are very large, and the flowers beautiful. Other plants remain almost wholly submerged, the leaves in that case becoming small and more or less thread-like, while the flowers may be either submerged or floating on the surface. Many of the seaweeds and some plants in the inland waters are buoyed up by bladders that form on the leaves, and in a few species the plants break loose entirely from the earth and float about in the waters, from which they obtain their subsistence by means of their roots. There are representatives of aquatic plants in many different families, of which the common water lily, the pond weed, the cat-tail and the water hyacinth are notable examples.

A′quatint, a method of engraving on copper. The outline of the picture is first etched on the plate, which is then thoroughly cleaned and re-covered with a thin layer of etching ground. When dry, the parts to be aquatinted are carefully painted over with a mixture of olive oil, lamp black and turpentine, which is laid on with a hair pencil. This mixture dissolves the etching ground over the parts of the plate to which it has been applied. The plate is then wiped dry and a light coating of finely powdered resin or mastic is sprinkled over it. When the surface is evenly covered the superfluous resin is shaken off, and the plate is gently heated until the resin melts and adheres to the cleaned metal. In melting, the grains of resin run into small granules, leaving minute portions of the plate uncovered. A weak solution of nitric acid is then poured over the plate and corrodes the portions between the granules of resin. When corroded sufficiently to form light shadows, the process is stopped and the plate is cleaned and re-covered, when the process is repeated for the next deeper shades. By continuing the process, any number of shades desired can be brought out. See ENGRAVING; ETCHING.

Aq′ueduct, an artificial channel or conduit for the conveyance of water from one place to another. The name is more particularly applied to structures for conveying water from distant sources for the supply of large cities. Aqueducts were extensively used by the Romans, and many of them still remain in different places on the continent of Europe, some being still in use. The Pont du Gard in the south of France, 14 miles from Nîmes, is still nearly perfect, and is a grand monument of the Roman occupation of that country. The ancient aqueducts were constructed of stone or brick, sometimes tunneled through hills and carried over valleys



AQUEDUCT OF CLAUDIUS, ROME

and rivers on arches. The Pont du Gard is built of great blocks of stone; its height is 160 feet, and the length of the highest arcade is 882 feet. The aqueduct at Segovia, originally built by the Romans, has in some parts two tiers of arcades 100 feet high, is 2921 feet in length, and is one of the most admired works of antiquity. One of the most remarkable aqueducts of modern times is that constructed by Louis XIV for conveying the waters of the Eure to Versailles.

AQUEDUCT NEAR NIMES, FRANCE

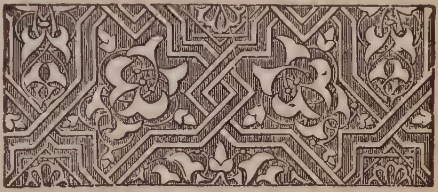
The extensive application of metal pipes has rendered the construction of aqueducts of the old type unnecessary; but what may be called aqueduct bridges are still frequently constructed in connection with waterworks for the supply of towns. Where canals exist, canal aqueducts are common, since the water in a canal must be kept on a level. In the United States there are some important aqueducts, as the Croton, about 40½ miles long, bringing water to New York (See CROTON AQUEDUCT).

The aqueduct or flume which conveys the water from the mountains to the reservoir at San Diego, Cal., is 35 miles long and is built almost wholly of redwood. It crosses 315 streams and canyons, on trestles, the longest of which is 1700 feet and has a height of 85 feet. The timbers used in these trestles were put together on the ground and raised to their position by horse power. This aqueduct passes also through eight tunnels, the longest being 2100 feet.

Aqui'nas, SAINT THOMAS (1227–1274), a celebrated divine, who taught at Cologne, Rome, Bologna and Pisa. His scholars called him "The Angelic Doctor." The most important of his numerous works, which were all written in Latin, is the *Summa Theologiae,* the standard authority in the Roman Church. Aquinas was canonized by John XXII in 1323.

Aq'uita'nia (later Aquitaine), a Roman province of Gaul which comprised the countries on the coast from the Garonne to the Pyrenees, and from the sea to Toulouse. It was brought into connection with England by the marriage of Henry II with Eleanor, daughter of the last duke of Aquitaine. The title to the province was for long a matter of dispute between England and France, but in 1451 it was secured by the latter.

Arabesque *ar a besk',* a term originally applied to the fantastic ornamentation which was used in the architecture of the Arabs and Moors in Spain. The term, however, is now generally used to designate any kind of ornamentation of a fanciful character. In the arabesques of the Mohammedans the figures of men and animals were entirely excluded, in accordance with a religious law in the Koran, and architects and artists confined themselves to geometric devices, foliage, fruit, floral forms and the like, which were arranged in elaborate designs. The most beautiful Moorish arabesques are found in the Alhambra, Spain, and the best examples of Roman work in this same style are the works of Raphael in the Vatican, imitated from earlier friezes.


ARABESQUE

Ara'bia, a vast peninsula in the southwest of Asia, with an area of over 1,000,000 sq. mi. and a population of not more than 5,000,000. Roughly described, it exhibits a central tableland surrounded by a series of deserts with numerous scattered oases, while around this is a line of mountains parallel to and approaching the coasts. A narrow rim of low ground lies between the mountains and the sea. In its general features Arabia resembles the Sahara, of which it may be considered a continuation. Arabia does not constitute a single state. The Sinai Peninsula belongs to Egypt; the provinces of Hedjaz and Yemen and the region of El-Hasa are more or less under the suzerainty of Turkey, while Aden is under the protectorate of Great Britain. The rest of the country is ruled by independent chiefs with the title of emir, sheik or imam. The chief towns are Mecca, the birthplace of Mohammed; Medina, the place to which he fled from Mecca, and where he is buried; Mocha, a seaport celebrated for its coffee; Aden, a strongly fortified garrison belonging to Britain; and Muscat, the capital of Oman, a busy port with a safe anchorage. See ADEN; MECCA; MEDINA.

The climate of Arabia is in general marked by extreme heat and dryness. Aridity and barrenness characterize both high and low grounds, and the date-palm is often the only sign of vegetable life. There are districts which in the course of the year are scarcely refreshed by a single shower of rain. The area of forest land is small. Instead of pastures there are steppe-like tracts, covered for a short season with aromatic herbs, which serve as food for the cattle. The date-palm furnishes the staple article of food; the cereals are wheat, barley, maize and millet; various sorts of fruit flourish, and coffee and many aromatic plants and substances, such as gum-arabic, benzoin, mastic, balsam, aloes, myrrh and frankincense, are produced. There are also cultivated in different parts of the peninsula, according to the soil and climate, beans, rice, lentils, tobacco, melons, saffron, poppies and olives. Sheep, goats, oxen, the horse, the camel, the ass and the mule are the chief domestic animals. Among the wild animals are gazelles, lions, panthers, hyenas and jackals, while in the oases ostriches are numerous. Among mineral products are saltpeter, mineral pitch, petroleum, salt, sulphur and several precious stones, as the carnelian, the agate and the onyx.

The Arabs, as a race, are of middle stature, of powerful though slender build, have a skin of a more or less brownish color and well-cut features. They are naturally active, intelligent and courteous, and are noted for their hospitality. Education is so wide-spread that illiteracy is unknown. The mode of life of the Arabs is either nomadic or settled. The nomadic tribes are called *Bedouins*, and among them are Arabs of the purest blood. Commerce is largely in the hands of foreigners, among whom the Jews and Banians are the most numerous.

The first religion of the Arabs, the worship of the stars, was supplanted by the doctrines of Mohammedanism, which succeeded rapidly in establishing itself throughout Arabia. Besides the two principal sects of Islam, the Sunnites and the Shiites, there also exists, in considerable numbers, a third Mohammedan sect, the Wahabis, which arose in the latter half of the eighteenth century and for a time possessed great political importance in the peninsula.

The history of the Arab peoples previous to the time of Mohammed is obscure. The earliest inhabitants are believed to have been of the Semitic race. Jews in great numbers migrated into Arabia after the destruction of Jerusalem, and, making numerous proselytes, indirectly favored the introduction of the doctrines of Mohammed. With his advent the Arabians united for the purpose of extending the new creed; and under the caliphs, the successors of Mohammed, they attained great power and founded large and powerful kingdoms in three continents (See MOHAMMED; MOHAMMEDANISM).

On the fall of the caliphate of Bagdad in 1258 the decline set in, and on the expulsion of the Moors from Spain, the foreign rule of the Arabs came to an end. In the sixteenth century Turkey subjected Hedjaz and Yemen and received the nominal submission of the tribes inhabiting the rest of Arabia. The subjection of Hedjaz has continued down to the present day, but Yemen achieved its independence in the seventeenth century and maintained it till 1871, when the territory again fell into the hands of the Turks. In 1839 Aden was occupied by the British. Oman early became virtually independent of the caliphs and grew into a well-organized kingdom. In 1507 its capital, Muscat, was occupied by the Portuguese, who were not driven out till 1659. The Wahabis appeared toward the end of the eighteenth century and took an important part in the political affairs of Arabia, but their progress was interrupted by Mohammed Ali, pasha of Egypt, and they were completely defeated by Ibrahim Pasha. He extended his power over most of the country, but the events of 1840 in Syria compelled him to renounce all claims to Arabia. The Hedjaz thus again became subject to Turkish sway. Turkey has since extended its rule not only over Yemen but also over the district of El-Hasa, on the Persian Gulf.

The Arabic language is one of the two living dialects of Semitic speech, and it is distinguished among Semitic tongues for its richness, softness and high degree of development. By the spread of Islam it became the sole written language and the prevailing speech in all southwestern Asia and eastern and northern Africa, and for a time in southern Spain, in Malta and in Sicily; and it is still used as a learned and sacred language wherever Islam is spread.

Mohammed gave a new direction to Arab literature. The rules of faith and life which he laid down were collected by Abu-bekr, the first caliph after his death, and published by Othman, the third caliph, as the *Koran*—the Mohammedan Bible. Most of the geography in the Middle Ages is the work of the Arabians, and their historians since the eighth century have been very numerous. In medicine they excelled all other nations in the Middle Ages, and they are commonly regarded as the earliest experimenters in chemistry. Their mathematics and astronomy were based on the works of Greek writers, but the former they enriched, simplified and extended. It was by them that algebra was introduced to the western peoples. Astronomy they especially cultivated, and observatories were erected at Bagdad and Cordova. Tales and romances in prose and verse were written. Tales of fairies, genii, enchanters and sorcerers in particular, passed from the Arabians to the western nations, as in *The Arabian Nights*.

Ara'bian Nights or **The Thousand and One Nights,** a celebrated collection of Eastern tales, supposed to have been derived by the Arabians from India, through the medium of Persia. They were first introduced into Europe in the beginning of the eighteenth century by means of the French translation of Antoine Galland. The story which connects the tales of *The Thousand and One Nights* is as follows: The sultan Shahriyar made a law that every one of his future wives should be put to death the morning after marriage. At length one of them, Shahrazad, the generous daughter of the grand vizier, succeeded by a strategem in abolishing the cruel custom. By breaking off each night in the middle of an interesting tale, she led the sultan to delay her execution day after day, until he had fallen in love with her and decided to let her live. The tales have been translated into almost all languages and have attained a wider circulation than any other book except the Bible.

Arabian Sea, the part of the Indian Ocean between Arabia, India and Beloochistan. The Red Sea and the shallow Persian Gulf are properly arms of the Arabian Sea. Its former commercial importance has been somewhat restored since the opening of the Suez Canal in 1869.

Ar'abic Nu'merals. See ARITHMETIC.

Arabi Pasha, *a rah'be pa shah'* (1841–), Egyptian soldier and revolutionary leader. In September, 1881, he headed a military revolt, and was for a time virtually dictator of Egypt. England interfered, and after a short campaign, Arabi surrendered and was banished to Ceylon. In 1901 he was allowed to return to Egypt.

Arachnida, *a rak'ni dah,* a class of air-breathing animals which include the spiders, scorpions, mites and ticks. A few live on plants, but most of them are carnivorous. As a whole, they are beneficial to agriculture, as they prey on other insects; but some parasitic forms are destructive to both plants and animals. Many have glands which secrete poisons, and the spiders have attached to their abdomens spinnerets, from which are secreted the threads of which webs are formed. They are a subdivision of the Arthropoda. See ARTHROPODA; SPIDER.

Arafat, *ah rah faht',* or **Jebel Errahm** (mountain of mercy), a granite hill in Arabia, 15 mi. s. e. of Mecca. It is about 200 feet high and has stone steps reaching to the summit. It is one of the principal objects of pilgrimage among Mohammedans, who say that it was the place where Adam first received his wife, Eve, after they had been expelled from Paradise and separated from each other 120 years. A sermon delivered on the mount constitutes the main ceremony of the Hadj, or pilgrimage to Mecca, and entitles the hearer to the name and privileges of a Hadji, or pilgrim.

Arago, *ah'ra go,* DOMINIQUE FRANCOIS (1786–1853), a celebrated French scientist and statesman who gained especial fame as an investigator in physics and astronomy. He made important discoveries in magnetism and optics and was a popular writer on these subjects. He graduated from the polytechnic school and was appointed to a commission which was making certain measurements of longitude that were to serve as the basis of a decimal metric system. While engaged in this work he was taken prisoner as a spy by the Spaniards, underwent hardships and narrow escapes, but finally reached Marseilles. On returning to Paris he was at once elected a member of the Institute. In 1830 be became perpetual secretary of the Academy of Sciences and director of the observatory. He was elected a member of the Chamber of Deputies in 1831, and there made many famous speeches in behalf of education, science, and, especially, the rights of the people. Arago was president of the Council General of the Seine until 1849 and was the chief instrument in the emancipation of slaves. After the revolution of 1848 he was appointed minister of war and marine. He favored liberal institutions as exemplified in the United States. Arago was the author of about sixty scientific works and memoirs.

Aragon, *ah ra gon',* a former province or kingdom in the northeastern part of Spain, now divided into the three provinces of Teruel, Huesca and Saragossa. It was governed by its own monarchs until the union with Castile on the marriage of Ferdinand and Isabella in 1469. The real union of the countries, however, did not come until some ten years later. See FERDINAND V.

Araguay, *ah rah gwi′*, or **Araguaya,** *ah′ra-gwa yah′*, a Brazilian river, rising in the Serra Cayapo. It flows north and joins the Tocantins at Sao Joao. About the middle of its course it divides into two arms, enclosing the island of Bananal. The length of the Araguay is 1300 miles, of which 750 are navigable. The lower course has numerous rapids.

Ar′al, a salt-water lake in Asia, in Russian territory, about 150 mi. w. of the Caspian Sea. Of the numerous rivers which formerly emptied into it, two alone now reach it—the Amu-Darya or Oxus, and the Syr-Darya or Jaxartes. The lake contains an abundance of sturgeon and other fish. It has a large number of islands. Navigation on it is difficult because of the shallowness of the waters and the fierce and sudden storms from the northeast.

Ar′ama′ic, a branch of the Semitic language, nearly allied to the Hebrew and Phoenician, anciently spoken in Syria and Palestine, and eastward to the Euphrates and Tigris. It was the official language of this region under the Persian domination. In Palestine it supplanted Hebrew, and it was the tongue of the Jews in the time of Christ. Parts of *Daniel* and *Ezra* are written in Aramaic, or, as this form of it is often named, Chaldee. An important Aramaic dialect is the Syriac, in which there is an extensive Christian literature. See CHALDEE LANGUAGE; HEBREW LANGUAGE AND LITERATURE.

Arap′ahoe, a tribe of American indians once located near the head-waters of the Arkansas and Platte rivers, but now of no importance. The survivors live in Oklahoma, where they are peaceable and teachable.

Ar′arat, MOUNT, a celebrated mountain of Armenia, in western Asia, on which, tradition says, Noah's ark rested. It rises in two volcanic cones, the higher one of which is 17,260 feet above sea level. Frightful earthquakes visit the region. In 1840, masses from the mountain were thrown into the plain, destroying the gardens, convent and chapel of the village of Arguri, and burying many people. Here Russian, Turkish and Persian territories meet, the summit of the mountain being Russian territory.

Araucanian, *ah′row kah′ne an*, a native race living in the southern part of Chile. They are warlike and more civilized than many of the native races of South America, and maintained almost unceasing war with the Spaniards from 1537 to 1773, when their independence was recognized by Spain, though their territory was much curtailed. In 1882 they submitted to Chile. The Chilean province of Arauco receives its name from them.

Ar′auca′ria, a genus of cone-bearing trees belonging to the southern hemisphere. They are lofty evergreen trees, with large, stiff, flattened leaves, generally overlapping along the branches, like the shingles on a roof. The spreading branches are in whorls around the trunk and bear large cones, each scale covering a single large seed, which is edible when roasted. The Moreton Bay pine of New South Wales supplies a valuable timber used in house and boat building, in making furniture and in other carpenter work. Another species, the Norfolk Island pine, abounds in several of the South Sea Islands, where it attains a height of 220 feet, with a circumference of thirty feet. It is described as one of the most beautiful of trees. Its foliage is light and graceful, quite unlike that of the Chile pine, which is stiff and formal in appearance. Its timber is of some value, being white, tough and close-grained.

Ar′balest. See CROSSBOW.

Arbe′la (now Erbil), a place in the Turkish province of Bagdad which gave its name to the decisive battle fought by Alexander the Great against Darius, at Gaugamela, about twenty miles distant from it, 331 B. C. Population, about 4000.

Arbitra′tion, the hearing and determination of a cause between parties in controversy, by a person or persons chosen by the parties. This may be done by one person, but it is common to choose more than one. Frequently two are nominated, one by each party, with a third, the *umpire*, often chosen by these two, to decide in case of the primary arbitrators differing. The determination of arbitrators is called the *award*. The disputes of nations were in ancient times settled only by war, but from the Middle Ages on, arbitration has constantly gained a stronger hold among nations, until to-day it is the recognized means of settling controversies. In this regard the United States has set a high example by repeatedly inviting arbitration in her own affairs and urging it upon other nations. Her notable triumphs in this respect include the Alabama, Bering Sea and Venezuela boundary disputes. See PEACE CONFERENCE, INTERNATIONAL.

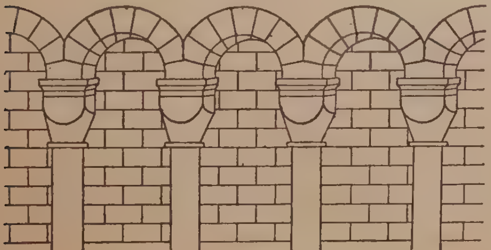
Industrial arbitration is also gaining ground, the most notable instance in recent years being the settlement of the coal strike in 1902.

Ar′bor Day, a day designated by legislative enactment in many states for the voluntary planting of trees by the people. It was inaugurated in 1874 by the Nebraska state board of agriculture, at the suggestion of J. Sterling Morton, afterwards secretary of agriculture in President Cleveland's second administration. Nearly every one of the states has since established an annual Arbor Day and observes it as a legal holiday, the school children being generally prepared for a special observance of the occasion. Bird Day is also now associated with Arbor Day, its purpose being to instruct children in the care and protection of birds. Several states publish manuals of exercises and instructions for the day's observance in the schools.

Ar′bor Vi′tae (tree of life), the name of several cone-bearing trees, allied to the cypress, with flattened branchlets, and small or scale-like leaves, overlapping like the shingles on a roof. The common arbor vitae is a native of North America, where it grows to the height of forty or fifty feet. The young twigs have an agreeable balsamic smell. The Chinese arbor vitae, common in Britain, yields a resin which was formerly thought to have medicinal virtues.

Arbutus, *ahr′bu tus,* a genus of plants belonging to the heath family and comprising a number of small trees and shrubs, natives chiefly of Europe and North America. The *trailing arbutus* or *May-flower* of North America, a choice plant with fragrant and beautiful blossoms, is of the same natural order.

Arcade, *ahr kade′,* a series of arches supported by columns either attached to a wall or having an open space behind them. The word is used in contradistinction to *colonnade,* which is a series of columns supporting a straight entablature instead of arches. The arcade is found both in the inside and outside decoration of medieval buildings. In street architecture, it is a covered way or passage, either open at the side with a row of columns or entirely covered over and lined with shops and stalls. The finest arcades of this description are to be found in Paris, though Bologna, Padua and Berne also have fine examples.



ARCADE

Arca′dia, the central and most mountainous portion of the Peloponnesus (Morea), the inhabitants of which in ancient times were celebrated for simplicity of character and manners. Their occupation was almost entirely pastoral, and thus the name *Arcadia* has come to be regarded as typical of rural simplicity and happiness. See GREECE; SPARTA.

Arc de Triomphe de l'Etoile, *ahrk de′tre′oNf′ de la twahl′,* the largest triumphal arch in the world, located at Paris, begun by Napoleon in 1806 to commemorate his victories. It has three arches, the central one being 95 feet high. The whole structure is 160 feet high and 150 feet long.

Arch, in architecture, a portion of mason work in the form of a curved structure used to span an opening, and in buildings to support heavy weights. It is composed of wedge-shaped pieces, the middle stone being called the *keystone* and the lowest stone on either side the *springer.* The highest part is the *crown*; the sides, *haunches*; the inner curve, the *intrados*; the exterior or upper curve, the *extrados*; the base which supports the lowest stone on each side, the *impost.* The simplest and oldest means of supporting a structure over a doorway was the use of a single stone, or *lintel,* of sufficient length. This expedient for the most part met the needs of the early Egyptians, Assyrians, Etruscans and Greeks, who were acquainted with the arch but used it only occasionally. The Romans employed the arch extensively and developed it to its highest type of usefulness, introducing it not only in their buildings but also in the drains, aqueducts and bridges. The opening of the Cloaca Maxima, or Great Sewer, is still seen at Rome and is supposed to be the oldest Roman arch, having been built about 500 B. C. The form of the curved arch continued in use everywhere till the Middle Ages, when the pointed or Gothic form was introduced. Out of this arch there developed a great variety of forms.

The longest stone span in the United States, and one of the two longest in the world, is the Cabin John Bridge, near Washington, D. C., with a span 220 feet long, a rise of 57 feet and a width of 20 feet (See BRIDGE). An arch 251 feet in span, the largest stone arch ever made, was built over the river Adda in northern Italy in the latter part of the fourteenth century.

Arches are used not only for constructive but also for decorative purposes. Sometimes a floral or light arch is built across a street on the occasion of some public event, and, again, single arches are erected for gateways or as memorials. The latter form, or *triumphal arch*, was originally a simple, decorated arch under which a victorious Roman general and army passed in triumph; but, at a later period, for the simplicity was substituted elaborate decoration. During the Middle Ages the triumphal arch fell into disuse, but since the Renaissance many memorial arches have been built, and today they are generally popular. See ARC DE TRIOMPHE DE L'ETOILE; CONSTANTINE, ARCH OF; SEPTIMIUS SEVERUS, ARCH OF; TITUS, ARCH OF; TRAJAN, ARCH OF.

Archaean, *ahr ke′an,* **System** or **Archaean Period,** also sometimes called the *Azoic Era,* the name of the oldest division of geologic time. The rocks of this period underlie the oldest sedimentary and fossiliferous formations. They are of igneous origin (See IGNEOUS ROCKS) and are generally supposed to form the oldest portion of the earth's crust. They are represented by granites, gneisses and schists, and most of them have been subjected to many disturbances, which have entirely changed their original character so that it is impossible to work out any order of succession of strata that will apply to all parts of the world. As a rule the Archaean rocks form the cores of the great mountain systems and are the original source from which the mountains rise. In the United States they are found covering a large portion of the region between the Arctic Ocean and the Great Lakes, in the Adirondacks, along the Appalachians and in the Rocky Mountains. In Europe they are prominent in the Scandinavian Peninsula, France, Germany and Austria. They also occur in eastern Asia and central Africa. See ALGONKIAN SYSTEM; CAMBRIAN SYSTEM.

Archaeology, *ahr′ke ol′o jy,* the science which deals with the history of nations and peoples, as shown by the remains which belong to an earlier epoch of their existence. In a more extended sense the term embraces every branch of knowledge which bears on the origin, religion, laws, language, science, arts and literature of ancient peoples. It is to a great extent the same as *prehistoric annals*, as a large, if not the principal, part of its field of study extends over those periods in the history of the human race, in regard to which we possess almost no information derivable from written records. Archaeology divides the primeval period of the human race, more especially as exhibited by remains found in Europe, into the Stone, the Bronze and the Iron ages, according to the chief material employed for weapons and implements during the particular period. See AGE.

Archaeopteryx, *ahr′ke op′te rix,* the name given to a fossil bird found in the stones of Bavaria. From these remains it was evident that the bird was about the size of a crow and possessed a long, cumbersome tail, supported by twenty vertebrae. It was evidently of little assistance in flying. Most strange of all, it had, in both mandibles of its rather blunt bill, a number of teeth, each set in a separate socket. This is the oldest known species of bird and is exceedingly interesting, as showing the possible relationship between the reptiles and the birds.

Archangel, *ahrk ane′jel,* a term used twice in the New Testament in reference to the angel who ranks first. Originally, in the Old Testament, the word angel meant nothing but a supernatural being, but in the later Scriptures the idea of rank and of a distinction between good and bad angels, some of whom are even named, appeared.

Archangel, *ahr kahn′jel,* or **Archangelsk,** a seaport, capital of the Russian government of the same name, on the right bank of the northern Dvina, about 740 mi. n. e. of Saint Petersburg. The place has some manufactures and an important trade, exporting linseed, flax, tow, tallow, train-oil, mats, timber, pitch and tar. The port is closed for six months of the year by ice. Archangel, founded in 1584, was long the only port which Russia possessed. It is the largest town in the world situated so far north. Population, 20,933.

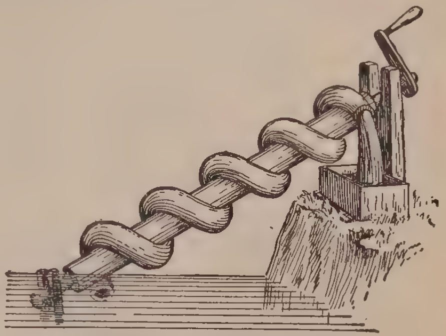
Arch′bald, PA., a borough in Lackawanna co., 10 mi. n. e. of Scranton, on the Lackawanna River and on the Delaware & Hudson and the New York, Ontario & Western railroads. Coal-mining is the principal industry, but there are also two silk mills. About one-third of the inhabitants are of foreign birth, chiefly Irish and German. Population in 1910, 7194.

Archbish′op, the chief bishop of an ecclesiastical province, which is usually termed a *see.* The title originated sometime in the fourth century, and the office is recognized in the Anglican, Roman Catholic and Greek churches. The archbishop of Rome is the pope, and the patriarch of Moscow holds a similar position in the Greek Church. England has two archbishops, one at Canterbury and the other at York. The archbishop of Canterbury is styled primate of all England, and has supreme ecclesiastical authority over the Anglican Church of the United Kingdom. The Roman Catholic is the only church maintaining the office of archbishop in the United States, which is divided into fourteen provinces or sees. See BISHOP.

ARCHER-FISH

Arch′er-fish, a name given to a small, spiny fish about six inches long. inhabiting the seas around Java, which has the faculty of shooting drops of water to the distance of three or four feet at insects, thereby causing them to fall into the water, where they are seized and devoured. The soft and even the spiny portion of their dorsal fins are so covered with scales as to be scarcely distinguishable from the rest of the body.

Arch′ery, the art of shooting with a bow and arrow. The use of these weapons in war and the chase dates from the earliest antiquity. Ishmael, we learn from *Genesis* XXI, "became an archer." The Egyptians, Assyrians, Persians and Parthians excelled in the use of the bow, and while the Greeks and Romans themselves made little use of it they employed foreign archers as mercenaries. The English victories of Crécy, Poitiers and Agincourt may be ascribed to the bowmen. Archery disappeared gradually as firearms came into use, and as an instrument of war or the chase the bow is now confined to the savage tribes of both hemispheres. But though the bow has been long abandoned among civilized nations as a military weapon, it is still cherished as an instrument of healthful recreation. In recent years a number of archery clubs for shooting at bull's-eye targets have been formed in the United States, and interest in the sport is increased by the fact that it is an open air sport for women as well as for men.



TUBULAR ARCHIMEDEAN SCREW

Archimedean, *ahr′ki me de′an,* **Screw,** a device for raising water, consisting of a spiral blade attached to an axis and enclosed in a tightly fitting cylinder. The device is fixed to an incline and has the lower end immersed in the water. By turning the crank the water is raised and flows out of the upper end of the cylinder. A simpler pattern is made by winding a tube like a piece of lead pipe spirally round an axis. The Archimedean screw can be used successfully to raise water from twelve to fifteen feet. It is sometimes employed where it is desired to raise a large quantity of water with comparatively little power.

Archimedes, *ahr′ki mee′deez* (287–212 B. C.), the greatest mathematician of antiquity, a native of Syracuse in Sicily The most important among his extant works are three on plane geometry, three on solid geometry, three on mechanics and one on arithmetic. He discovered the principle of the lever and of specific gravity; constructed a machine for raising water, called the Archimedean Screw, and invented burning mirrors and hurling engines that made effective siege artillery. After the siege of Syracuse, where with his burning glasses Archimedes had fired the Roman fleet, a Roman soldier, rushing into the philosopher's study, found him calmly drawing geometrical figures. Not noticing the soldier's drawn sword, the old man cried, "Don't disturb my circles." Enraged, the soldier slew him on the spot.

Archipelago, *ahr'ki pel'a go.* See Island.

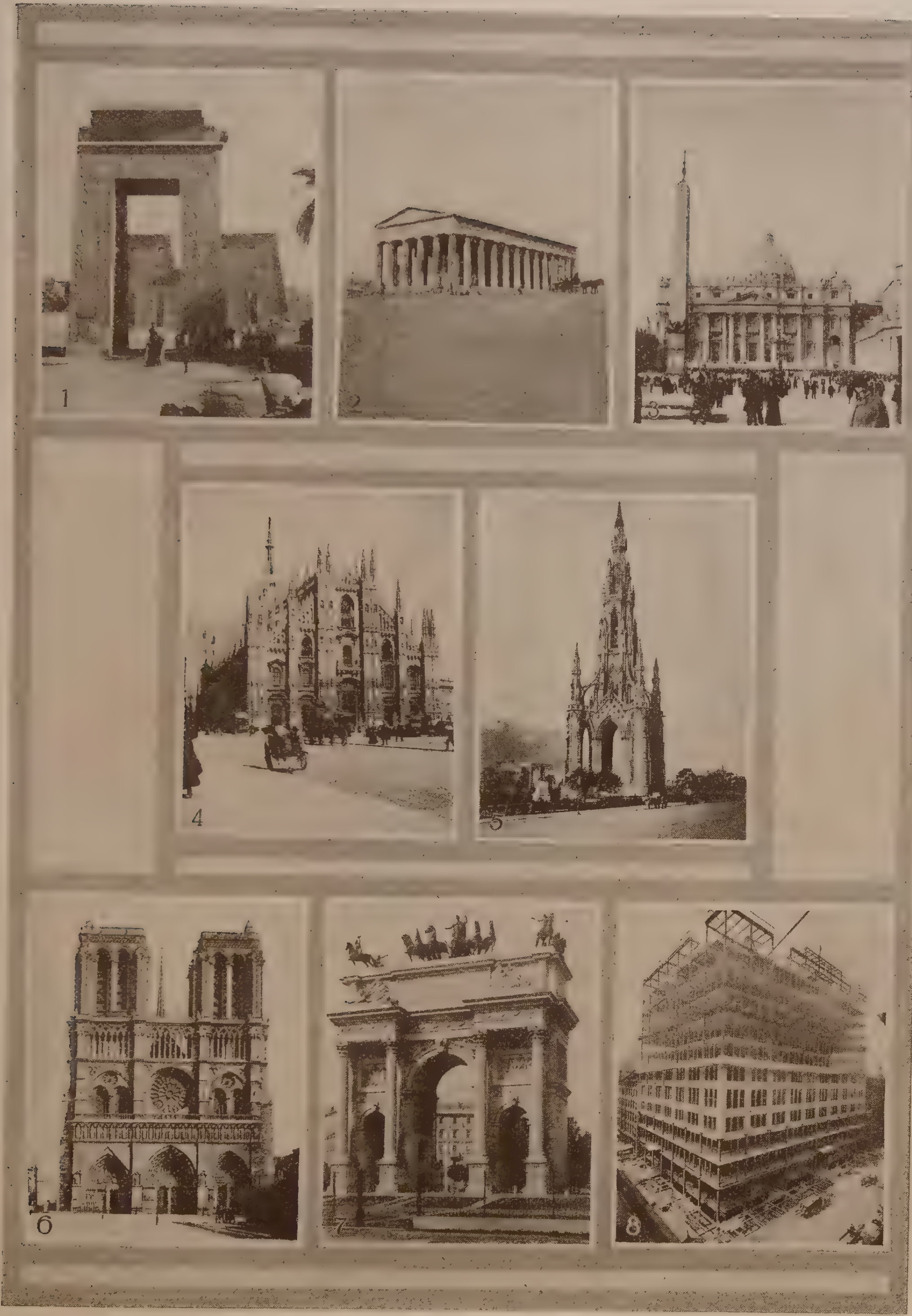
Architecture, *ahr'ki tek'ture,* in a general sense, the art of designing and constructing houses, bridges and other buildings; or that branch of the fine arts which has for its object the production of edifices, not only convenient, but characterized by unity, beauty and grandeur. A knowledge of the different styles of architecture may be gained by considering their development among the different nations.

Egyptian Architecture. The Egyptians are the most ancient nation known to us among whom architecture had attained the character of a fine art. Their first permanent buildings were excavated tombs, massive pyramids and primitive temples. The belief of the Egyptians that the present life was but a moment in comparison with eternity and that the body must be preserved for the soul to inhabit, was responsible for the architecture of the tombs, which were supposed to be built so strong that time could not destroy them nor an enemy rifle them. The Egyptian temples had walls of great thickness that sloped on the outside from bottom to top; the roofs were flat and composed of blocks of stone reaching from one wall or column to another, for the principle of the arch was not employed. Statues of enormous size, sphinxes carved in stone, and the outlines of deities and animals sculptured on the walls, with innumerable hieroglyphics, are the decorative objects which belong to this style. Architecture was the one supreme art in Egypt—painting and sculpture always were subordinate to it (See Pyramids; Sphinx).

Chaldean-Assyrian Architecture. The Chaldeans built with sun-dried brick, as there was no good stone in their country, and the Assyrians followed their example, covering the bricks with beautifully carved stones and stucco. Magnificence and beauty, rather than permanence, was their special aim. Vaults and arches were used, and as a result large rooms were possible. Their temples were in the shape of pyramids and were composed of terraces rising in tiers to a great height.

Other Ancient Architecture. The Hittites and Phoenicians followed the Assyrians in general style. They built heavy fortresses, great palaces, and temples which were small and inferior as compared with those of other nations. Their buildings have not stood the test of time. The Hebrews had no national architecture and what is known is derived only from historical accounts (See Temple). Oriental architecture developed by itself, and lacks the permanency of the West. Although many widely differing styles are to be found in India, the oldest and only true native style of Indian ecclesiastical architecture is the Buddhist, the earliest specimens dating to 250 b. c. Among the chief objects of Buddhist art are *stupas* or *topes,* built in the form of large towers and employed to contain relics of Buddha or of some noted saint. Other works of Buddhist art are temples or monasteries, excavated from the solid rock and supported by pillars of the natural rock left in place. The most remarkable Hindu or Brahmanical temples are in southern India. They are pyramidal in form, rising in a series of stories. The Chinese have made the *tent* the elementary feature of their architecture, and roofs are concave on the upper side, as if made of canvas instead of wood (See Pagoda).

Greek Architecture. In historic times the Greeks developed an architecture of noble simplicity and dignity, in part derived from the Egyptian. The earliest Greek architecture was rough and coarse, immense bowlders, piled one upon another, having been used for walls, as shown in the city of Tiryns. Architecture is considered to have attained its greatest perfection in the age of Pericles, or about 460–430 b. c. The great masters of this period were Phidias, Ictinus and Callicrates. The style is characterized by beauty, harmony and simplicity in the highest degree. The Greeks had three orders, called, respectively, the *Doric, Ionic* and *Corinthian* (See Column). Greek buildings were abundantly adorned with sculptures, and painting was extensively used, the details of the structures being enriched by different colors or tints. Lowness of roofs and the absence of arches were distinctive features of Greek architecture. The most remarkable public edifices of the Greeks were temples, of which the most famous is the Parthenon at Athens. They were at first very simple structures, but they were characterized by grace and simplicity, and they later reached the highest perfection of architectural beauty. These temples were usually built on a base of three low terraces. The shape was rectangular, and outside were rows of columns, the outer of which supported an entablature. The large room in the center was the sacred shrine (See Erectheum; Parthenon; Theseum). Their theaters were semicircular on one side and square on the other, the semicircular part being usually excavated in the side of some convenient hill. This part, the auditorium, was filled with seats arranged in concentric circles,



LEADING TYPES OF ARCHITECTURE

1. Egyptian—Pylon of the Temple at Karnak.
2. Greek—Theseum.
3. Italian Renaissance.
4. Gothic—Cathedral at Milan.
5. Gothic—Sir Walter Scott's Monument, Edinburgh, Scotland.
6. Early Gothic—Notre Dame, Paris.
7. Modern—Triumphal Arch, Milan.
8. Modern Steel Construction.

and could contain 20,000 spectators. A number exist in Greece, Sicily, Asia Minor and elsewhere (See THEATER).

ROMAN ARCHITECTURE. The Romans early took the foremost place in the construction of such works as aqueducts and sewers, the arch being extensively used (See CLOACA MAXIMA). As a fine art, Roman architecture had its origin in copies of the Greek models, but it added two new orders—the *Tuscan* and the *Composite* (See COLUMN). Rome attained under Augustus its greatest perfection in architecture. Among the great works erected were temples, aqueducts, amphitheaters, magnificent villas, triumphal arches and monumental pillars. The *amphitheater* differed from the theater in being a completely circular or rather elliptical building, filled on all sides with ascending seats for spectators and leaving only the central space, called the *arena*, for the combatants and public shows (See COLOSSEUM). The *thermae*, or baths, were vast structures in which multitudes of people could bathe at once. The excavations at Pompeii in particular have thrown great light on the internal arrangements of the Roman dwelling-house. After the period of Hadrian (117–138 A. D.) Roman architecture is considered to have been on the decline (See PANTHEON).

BYZANTINE ARCHITECTURE. In Constantinople, after its virtual separation from the Western Empire, arose a style of art and architecture which was practiced by the Greek Church during the whole of the Middle Ages. This is called the Byzantine style. The church of Saint Sophia at Constantinople, built by Justinian, who reigned from 527 to 565, offers the typical specimen of the style. Saint Mark's in Venice is one of the most striking examples of the later phase of the same form. In the typical examples the dome or cupola rests on four pendentives (See PENDENTIVE; SOPHIA, CHURCH OF SAINT). After the dismemberment of the Roman Empire the beautiful works of ancient architecture were almost entirely destroyed by the Goths, Vandals and other barbarians; or what was spared by them was ruined by the fanaticism of the Christians.

ROMANESQUE ARCHITECTURE. A new style of architecture then arose, of which the semicircular arch is the characteristic feature. Towers, porches, crypts, ornamented façades in stone, the vault in the form of a tunnel, the groin and ribbed-groin were other notable features of this type. Examples of this style are the Church of San Ambroglio, Milan; the Abbey of Vezelay in Central France, and the cathedrals at Speyer and Worms and along the Rhine border.

GOTHIC ARCHITECTURE. This term is applied to the various styles of pointed architecture prevalent in western Europe from the middle of the twelfth century to the revival of classic architecture in the sixteenth. The style grew out of the attempts on the part of the architects of the eleventh and twelfth centuries to perfect a system of vaulting. The Gothic type made use of the pointed or ribbed groin-vault, which substituted a more nearly vertical pressure than had been exerted in any of the forms used up to this time, and thus allowed the supporting piers to be made smaller, leaving large spaces for the windows. The chief characteristics of Gothic architecture are the predominance of the pointed arch and the subserviency and subordination of all the other parts to this chief feature; the tendency through the whole composition to the predominance and prolongation of vertical lines by the use of large windows filled with costly stained glass; the absence of the column and entablature of classic architecture; the absence of square edges and rectangular surfaces and the substitution of clustered shafts and contrasted surfaces. This style originated in France and spread very rapidly to England, Germany, Italy, Spain and the Scandinavian countries. It is in the cathedrals and churches that we find the highest development of Gothic architecture. Amiens, Cologne, Rheims. Notre Dame at Paris, and Chartres all furnish excellent examples of Gothic cathedrals. In the rich decoration, the characteristic feature is the recourse to models of nature, animals and flowers of every variety being used. No other art has so beautifully reproduced flowers and foliage in stone. The several periods of Gothic architecture are clearly marked by the form and general treatment of the windows (See CATHEDRAL; WINDOW).

RENAISSANCE ARCHITECTURE. The Gothic style was introduced into Italy, but it was never thoroughly naturalized. The Renaissance style soon superseded it. This was a revival of the classic style, based on the study of the ancient models, which commenced in Florence about the beginning of the fifteenth century, spread with great rapidity over Italy, and gradually over the greater part of Europe. The great aim was to make ornamental rather than useful buildings. The most illustrious architects of this early period of the style were Brunelleschi, who built at Florence the dome of the cathedral and the

Pitti Palace, besides many edifices at Milan, Pisa, Pesaro and Mantua; Alberti, who wrote an important work on architecture and erected many admired churches; Bramante, who began the building of Saint Peter's, Rome, and Michelangelo, who erected its magnificent dome. On Saint Peter's were also employed Raphael, Peruzzi and San Gallo. The period began early in the fifteenth century and continued through to the nineteenth, never producing a distinct style of its own, but modifying the forms which existed. The noted examples of this style, outside of those already mentioned, are the Louvre, the Tuileries, the Luxembourg and Versailles in France; the Heidelberg Schloss in Germany and Saint Paul's and Blenheim in England.

RECENT ARCHITECTURE. Since the Renaissance period there has been no architectural development requiring special note. In edifices erected at the present day some one of the various styles of architecture is employed, according to taste. Modern dwelling-houses have necessarily a style of their own as far as stories, apartments, windows and chimneys can give them one. In general the Grecian style, as handed down by Rome and modified by the Italian architects of the Renaissance. from its right angles and straight entablatures, is more convenient and fits better with the distribution of our common edifices than the pointed and irregular Gothic. But the occasional introduction of the Gothic outline and the partial employment of its ornaments has undoubtedly an agreeable effect, both in public and private edifices; and we are indebted to it, among other things, for the spire, a structure exclusively Gothic, which, though often misplaced, has become an object of general approbation and a pleasing landmark in cities and villages. The works most characteristic of the present day are the grand bridges, viaducts and similar structures, in many of which iron is the sole or chief portion of the material. In America the increase in the number of handsome buildings has been very noteworthy since the termination of the Civil War, and the architectural accomplishments of the World's Columbian Exposition at Chicago, in 1893, have never been excelled in any country. The methods of iron and steel construction in use in modern times is described in the article BUILDING. See MOHAMMEDAN ARCHITECTURE.

Arc Light, that kind of electric light in which the illuminating source is the current of electricity passing between two sticks of carbon kept a short distance apart, one of them being in connection with the positive, the other with the negative terminal of a battery or dynamo. See ELECTRIC LIGHT.

Arcole, *ahr'ko la,* a village in north Italy, 15 mi. s. e. of Verona, celebrated for the battles of November 15, 16 and 17, 1796, fought between the French under Bonaparte, and the Austrians, in which the latter were defeated with great slaughter. Population, about 1250.

Arc'tic Circle, an imaginary circle on the globe, parallel to the equator and 23° 28′ distant from the north pole. Its location marks the southern limit of the sun's rays shining over the north pole in the summer time. The name Arctic comes from *Arktos,* the Greek name of the constellation Bear.

Arctic Ocean, an ocean which surrounds the north pole and washes the northern shores of Europe, Asia and America, its southern boundary roughly coinciding with the Arctic Circle. It communicates with the Pacific by Bering's Strait and with the Atlantic by a wide passage between Greenland and Norway. The great rivers Obi, Yenisei and Lena, in Asia, and the Mackenzie in Canada, empty into this ocean. The Arctic Ocean encloses many large islands and has a number of bays and gulfs which deeply indent the adjacent continents, as Baffin's Bay, the White Sea and the Gulf of Obi. The water region around the pole is covered with great fields of ice, which are frozen together in winter, but become separated in summer. Animal life is very abundant in the Arctic, the lower forms being numerous as well in the deepest as in the surface waters. Of the fishes the most common are the cod and the polar shark. Mammals are more highly developed here than in any other part of the oceanic waters, and include the whale, the narwhal, the seal and the walrus. See NORTH POLAR EXPLORATION.

Arctic Region or **Arctica,** the region around the north pole, extending from the pole on all sides to the Arctic Circle. The Arctic or North Polar Circle just touches the northern headlands of Iceland, cuts off the southern and narrowest portion of Greenland, crosses Fox's Strait north of Hudson's Bay, whence it goes over the American continent to Bering's Strait. Thence it runs to Obdorsk at the mouth of the Obi, then crossing northern Russia, the White Sea and the Scandinavian Peninsula, returns to Iceland. The mean annual temperature within the Arctic Circle is below 32° F., and the plants and animals are such as are adapted to a cold climate. The polar bear, walrus and some species of seals are found and the reindeer and Eskimo dog have been domesticated. The inhabitants are Eskimos, Lapps and Finns, for a description of which see articles under their respective titles. Valuable minerals and fossils have been discovered within the Arctic regions. In the archipelago north of the American continent excellent coal frequently occurs. The mineral cryolite is mined in Greenland. Fossil ivory is obtained in the islands at the mouth of the Lena. In Scandinavia, parts of Siberia and northwest America, the forest region extends within the Arctic Circle. See NORTH POLAR EXPEDITIONS.

Arctu′rus, a fixed star of the first magnitude in the constellation of Boötes, thought by some to be the nearest to our system of any of the fixed stars. It is one of the stars observed to have a motion of its own, and is a noticeable object in the northern heavens.

Ard′more, a town of the Chickasaw nation, Oklahoma, on the Gulf, Colorado & Santa Fé railroad, 98 mi. n. of Fort Worth, Tex. There are extensive coal mines and asphalt deposits in the neighborhood. Population in 1900, 5681.

Are′ca, a genus of lofty palms which have feather-shaped leaves, and bear a one-sided berry or nut enclosed in a fibrous rind. One species of the Coromandel and Malabar coasts is the common areca palm, which yields areca or betel nuts, and also the astringent juice catechu. See BETEL; CABBAGE PALM.

Arecibo, *ah′ra se′bo,* a town of Porto Rico. situated on the n. coast, 50 mi. w. of San Juan. The town is arranged around a central plaza or square, which is surrounded by a church and other public buildings. The buildings are of wood or brick. Arecibo is of some commercial importance, but its harbor is poor and can be entered only by vessels of light draft. Population in 1903, about 12,000.

Arendal, *ah′ren dal,* a town on the southeast coast of Norway, at the mouth of Nid-Elv. It is built partly on rock and has many canals, which are responsible for its popular name, "The Little Venice." The chief exports are iron from the neighboring mines, and wooden articles. Population in 1900, 11,130.

Ar′eop′agus, the oldest of the Athenian courts of justice. It obtained its name from its place of meeting, on the Hill of Ares (Mars), near the citadel. It existed from very remote times, and the crimes tried before it were willful murder, poisoning, robbery, arson, dissoluteness of morals and innovations in the State and in religion.

Arequipa, *ah ra ke′pa,* a city of Peru, situated on the Chile River, 100 mi. n. e. of Mollendo, with which it is connected by railroad. The town is located on a plateau 7000 feet above the sea, and has an exceedingly dry climate. It is well laid out, has good streets, a cathedral, two national schools and a university. The leading industries are the manufacture of jewelry and the cutting of precious stones. The city has some commercial importance, as it is the center of trade for the interior of Peru. It was founded by Pizarro in 1540. In 1868 it was nearly destroyed by earthquakes. Population in 1901, 35,000.

Arezzo, *a ret′so,* a city of central Italy, capital of a province of the same name in Tuscany. It was one of the twelve chief Etruscan towns, and in later times fought long against the Florentines, to whom it had finally to succumb. It is the birthplace of Maecenas and of Petrarch. The chief manufactures are cloth, silk and leather, and a considerable trade is carried on in grain, wine, oil and fruit. Population in 1901, 16,886.

Ar′gand Lamp, a lamp named after its inventor, Aimé Argand a Swiss chemist and physician. The distinctive feature of the lamp is a burner, in the form of a ring or hollow cylinder, covered by a chimney, so that the flame receives a current of air both on the inside and on the outside. This causes complete combustion and produces a hot flame. Many kerosene lamps have burners constructed on this plan.

Argensola, *ahr′gen so′la,* LUPERCIO LEONARDO DE and BARTOLOMEO LEONARDO DE, Spanish poets, the "Horaces of Spain." They were brothers and were born at Barbastro, in Aragon, the former in 1565, the latter in 1566. Lupercio produced tragedies and lyric poems; Bartolomeo, a number of poems and a history of the conquest of the Moluccas. Their writings are singularly alike in character.

Argentina, *ahr jen te′na,* or **Argentine Republic,** next to Brazil the largest country of South America, extends from the 22nd degree to the 55th degree of south latitude, and from the 34th degree to the 58th degree of west longitude. Its length is about 2100 miles, its width varies from 200 miles in the south to 1000 miles in the north, and its area is 1,114,000 square miles, or about equal to that portion of the United States lying east of a line drawn south from the boundary separating North

Dakota from Minnesota. It is bounded on the north by Bolivia and Paraguay, on the east by Paraguay, Brazil, Uruguay and the Atlantic Ocean, and on the west it is separated from Chile by the high crest of the Andes.

SURFACE AND DRAINAGE. The larger part of Argentina is a low or rolling plain, rising gradually from the coast to the mountains in the west. In many respects this plain resemples in its surface, climate and vegetation the great central plain of the United States. In the northeastern portion of the country considerable areas are covered by the extension of the Brazilian highlands. A section between the Parana and Uruguay rivers is low, with the exception of the extreme northeastern portion, into which some of the Brazilian mountains extend. The surface of the western portion of the country is hilly or mountainous, containing peaks that exceed 17,000 feet in altitude. The highest of these, Aconcagua, lies just west of the dividing line between Argentina and Chile.

Argentina has about 1500 miles of coast line. It is drained in the north by the La Plata river system, which consists of the Parana and its tributaries and the Uruguay. The most important tributaries are the Parana from the north, the Pilcomayo, the Vermejo and the Salado. The central part of the country is drained by the Rio Colorado and Rio Negro, which flow into the Atlantic. The southern portion is traversed by the Chubut, the Chico and the Santa Cruz. Among the foothills of the Andes are numerous lakes, some of which are remarkable for their beauty, and in the plains are a few lakes which have no outlet and are surrounded by soft marshes.

CLIMATE. In location, Argentina corresponds in the southern hemisphere to that portion of North America extending from the latitude of Cuba to that of Hudson Bay, and it has in the lower lands a climate similar to those regions, with the exception that the warm regions are in the north and the cold in the south. The lowlands are divided into three climatic belts. The first, extending from the northern boundary to the latitude of Rosario, has a tropical or semitropical climate. The middle belt, extending from Rosario to about the 42nd parallel of latitude, has a temperate climate similar in nearly all respects to that found in the middle Atlantic and central states of the United States. South of this is the colder belt, having a climate resembling that of the north central states and certain portions of Canada, with the exception that in neither of the regions are found the extremes of heat and cold which characterize the interior of North America.

The rainfall in the northern portion varies from 50 to 70 inches annually. South of this, in the temperate belt, it is somewhat less, and it diminishes rapidly as it advances inland. The southern belt is dry. In the northern and central portions of the country there is ample rainfall for all agricultural purposes, and in the southern portion the precipitation is sufficient for grazing.

MINERAL RESOURCES. In the mountainous regions are found extensive deposits of iron, copper, lead and silver, and gold has been found both in the mountainous regions and on some of the rivers. There are also valuable deposits of soda and borax, and coal occurs in the southern provinces. Petroleum has also been found in a few localities. As yet none of these deposits has been worked to a great extent.

AGRICULTURE. The country is favorably situated for agriculture, and this is by far the most important industry. The northern belt is given to the growth of grains and tropical fruits, sugar cane and cotton, while the central belt is especially adapted to the growth of wheat, oats, barley, potatoes, flax and all other agricultural products suited to the temperate regions. Wheat is by far the most important crop, and the annual yield averages in value about $95,000,000. Stock-raising is also an important industry. The central belt is especially suited for this, since it contains many square miles of excellent grazing land. It is estimated that Argentina contains over 25,000,000 cattle and 100,000,000 sheep, and it has become one of the leading countries in the production of wool.

MANUFACTURES. The manufacturing industries are still limited. In general they are along those lines which work up the raw material of the country into finished or partially finished products. Among the important manufactories are flour mills, meat-packing establishments, breweries, sugar refineries and tanneries. There are also important manufactures of other food products, and the manufacture of clothing, boots and shoes and small wares is assuming some prominence.

TRANSPORTATION. The La Plata river system and its tributaries afford the northern portion of the country ready access to the sea. Large steamers ascend the Parana for 1200 miles, and the river is navigable for lighter boats its entire length. Many of its larger tributaries are also navigable. The country contains over 25,000 miles of railway, and the lines are so constructed as to join together all the important cities and towns in the northern and central portions. Lines are also constructed in the southern territories, and a transcontinental line connects Buenos Ayres with Santiago in Chile. Electric railways are found in all of the large cities and important towns, and excellent telegraph and telephone systems are owned and operated by the government.

COMMERCE. The commerce of Argentina is more extensive than that of any other South American country. Its annual average is about $450,000,000. The imports consist of manufactured products of all kinds, especially textiles, agricultural implements and railway supplies The important exports are wheat, flour, dressed meat, hides and tallow. Great Britain has the largest share of foreign trade, followed, in the order of their importance, by Germany, France and the United States.

INHABITANTS AND LANGUAGE. The early inhabitants were indians who resembled in their civilization the Incas of Peru. When the Spaniards conquered the country and settled there, many of them intermarried with the indians, and the inhabitants of the interior consist of a mixed race descended from these early marriages. Since the middle of the nineteenth century immigration has been encouraged, and now more than half of the population are immigrants or their descendants. Among these, Italians and Spaniards predominate. Next in order are the French, English and Germans. Spanish is the prevailing language.

EDUCATION. The country has a good system of public schools, which is organized and supervised by the department of public instruction. Each province is held responsible for the public schools within its own boundaries, and these are managed on a plan somewhat similar to that in vogue in the different states of the United States. Education is compulsory for all children between six and sixteen years of age, though in the outlying provinces this requirement is not well enforced. The government maintains normal schools, a national university and technical schools.

GOVERNMENT AND RELIGION. The government of Argentine closely resembles that of the United States. The national legislature consists of two branches, a senate and a house of representatives. The senate consists of 30 members, and is made up of two senators from each of the provinces. These are elected by the legislatures for the term of nine years, and the terms of one-third of the senate expire every three years. The number of members in the house of representatives is based upon population. In 1901 it was 133. The members are elected for four years by the people. The terms of one-half the members expire every two years. The president is elected by electors chosen in the different provinces. His term is for six years, and he is not eligible for reëlection. For local administration the country is divided into fourteen provinces and ten territories. Each province has its local legislatures, and the executive is independent in the management of its own affairs. The Roman Catholic Church is recognized as the State church and this faith is embraced by more than nine-tenths of the inhabitants, though other religions are tolerated without objection.

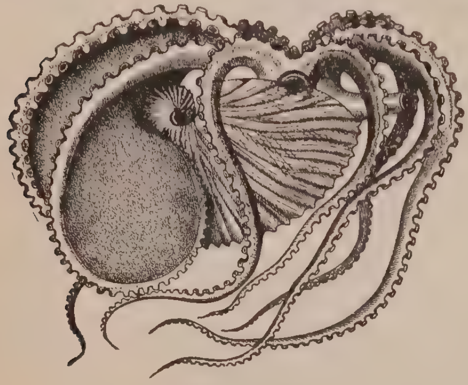
CITIES. The important cities are Buenos Ayres, the capital, Rosario and Cordova, each of which is described under its proper title.

HISTORY. Argentina was first visited in 1515 by Juan Diaz de Solis. Twelve years later Sebastian Cabot ascended the Parana and gave to the La Plata its name. He founded a colony on the river, but it was soon destroyed, and no permanent settlement was established until 1580. For nearly two centuries the settlements in Argentine were attached to the vice-royalty of Peru, but in 1776 the basin of the La Plata was made an independent vice-royalty. Later the provinces came under the rule of Spain, where they remained until 1816, when Argentina gained its independence. For the next fifty years the history of the country was one of internal strife, in which rebellions, revolutions and wars with neighboring states were so frequent that the development of the country's resources was impossible. The present constitution was adopted in 1853, and under it the country has gained its present prosperous condition. Population, about 6,500,000. Consult Child's, *Spanish-American Republics*.

Ar′gentine, KANS., a city in Wyandotte co., and a suburb of Kansas City, from which it is about 3 mi. distant, on the Atchison, Topeka & Santa Fé railroad. It has grain elevators, railroad repair shops and extensive smelting and refining works. Population in 1904, 6230.

Ar′gon, a gas forming less than one per cent of the atmosphere. It was discovered in 1894 by Lord Rayleigh and Professor Ramsey. It resembles nitrogen very closely, but is somewhat heavier. Its most marked property is its extreme inactivity.

Ar′gonaut, a name given to a species of cuttlefishes known also as the *paper nautilus* or *paper sailor.* This is the animal so celebrated in poetry, which was falsely supposed to sail on the surface of the sea, using its two extended arms as sails and its other arms as oars.



PAPER NAUTILUS

Argonauts, the fabled heroes of Greece who made the voyage in search of the golden fleece. According to tradition, long before the Trojan War, Aenos, king of Thessaly, became tired of ruling and conferred the crown on his brother, Pelias, on condition that he should rule only until Jason, the son of Aenos, became of age. When Jason reached the required age and demanded the crown of his uncle, Pelias seemingly complied, but suggested that Jason and his companions could gain great renown by going in search of the golden fleece, which was known to be in the distant land of Colchis, on the shores of the Euxine (Black) Sea.

In accordance with the suggestion, the young heroes planned for the voyage, the ship Argo was constructed for their service, and Jason and his companions, among whom were Orpheus, Castor and Pollux, Hercules and Theseus, started on their journey. After many adventures they reached Colchis, where they learned that the golden fleece was kept suspended from the branches of a tree and guarded by a dragon that never slept. Through the assistance of Medea, the daughter of the king of Colchis, a powerful sorceress, a deep sleep was made to fall upon the dragon. Jason captured the golden fleece and departed for Thessaly, taking Medea with him. This legend probably had its origin in some early voyage of discovery. See JASON.

Ar′gos, a town of Greece, in the northeast of the Peloponnesus, between the gulfs of Aegina and Nauplia, or Argos. The town and the surrounding territory of Argolis were famous from the legendary period of Greek history onward, the territory containing, besides Argos, Mycenae, where Agamemnon ruled, with a kind of sovereignty, over all the Peloponnesus. The patron deity of Argos was Hera or Juno, in whose shrine stood a statue of the goddess in ivory and gold. Some of the remains of this shrine have recently been excavated, and important works of art have been brought to light. Argolis and Corinth form a nomarchy of the kingdom of Greece.

Ar′gus, in Greek mythology, a fabulous being said to have had a hundred eyes. This monster was placed by Juno to guard Io, whom she hated. Hence, the term "argus-eyed" is applied to one who is exceedingly watchful.

Argyll, *ahr gile′.* GEORGE JOHN DOUGLAS CAMPBELL, eighth duke of, (1823–1900), statesman and author. As a Parliamentary orator he attained high rank, and some of his writings are important. Chief among them is *The Reign of Law.* His eldest son, the marquis of Lorne, married Queen Victoria's daughter, the Princess Louise, in 1871.

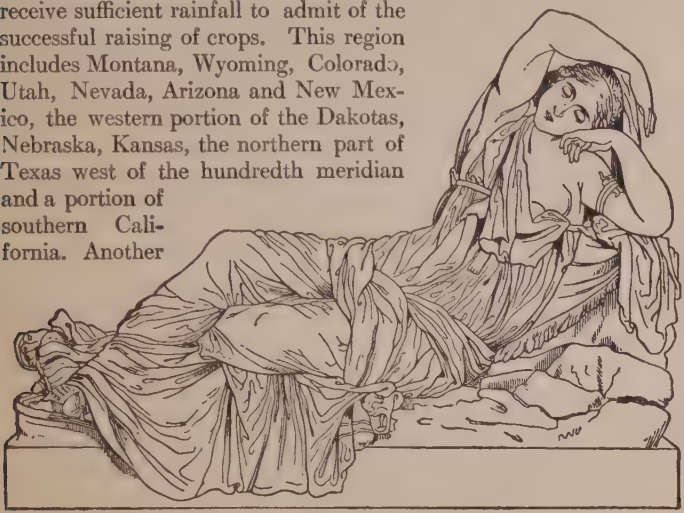
Argyll, JOHN CAMPBELL, second duke of, (1678–1743), Scotch statesman and general. He served at the battles of Ramillies, Oudenarde and Malplaquet and assisted at the sieges of Lille and Ghent. He was long a supporter of Walpole, but his political career was full of intrigue. He is the duke of Argyll in Scott's *Heart of Midlothian.*

Argyll, JOHN DOUGLAS SUTHERLAND CAMPBELL, ninth duke of (1845–), formerly marquis of Lorne, an English statesman and author. In 1868 he was sent to Parliament, where he represented Argyllshire for ten years. He married in 1871 the princess Louise, fourth daughter of Queen Victoria. In 1878 he was made governor general of Canada and his five-year administration was exceedingly popular. He became duke of Argyll in 1900. Among his writings are *The United States after the War, Imperial Federation, Psalms in English Verse* and *Life and Times of Queen Victoria.*

A′riad′ne, in Greek mythology, a daughter of Minos, king of Crete. She gave Theseus a clue of thread to conduct him out of the labyrinth after his defeat of the Minotaur, and when he left the country he took her with him. He abandoned her, however, on the Isle of Naxos.

where she was found by Bacchus, who married her. See THESEUS.

Ar′id Re′gion, a region that does not have sufficient rainfall to sustain a good growth of vegetation. The name applies particularly to that portion of the United States which does not receive sufficient rainfall to admit of the successful raising of crops. This region includes Montana, Wyoming, Colorado, Utah, Nevada, Arizona and New Mexico, the western portion of the Dakotas, Nebraska, Kansas, the northern part of Texas west of the hundredth meridian and a portion of southern California. Another smaller region is found in Oregon and the southeastern part of Washington, extending into Idaho. The area of the arid region of the United States is about one and a half million square miles. Large portions of this region receive sufficient rainfall to support a growth of grass and are successful grazing regions. In all of them the soil is fertile and, when supplied with water, produces abundant crops. See IRRIGATION.



THE SLEEPING ARIADNE
Vatican, Rome.

Aries, *a′ri eez,* (the ram), the first sign of the zodiac, measured from the vernal equinox. About 2000 years ago, the sun was passing through this constellation in the spring, but now the sun is due the twenty-first of March in the constellation of Pisces, about 20° west. The symbol is ♈, the horns of a ram, or the nose and eyebrows of the human face.

Ari′on, an ancient Greek poet and musician who was born at Methymna, in Lesbos, and flourished about 625 B. C. A fragment of a hymn to Poseidon, ascribed to Arion, is extant. The legend regarding him states that while he was on shipboard returning from Tarentum to Corinth, the sailors decided to put him to death for his wealth. After trying in vain to move them by his exquisite music, Arion threw himself into the sea, but he was saved by dolphins who had been attracted by his music and was carried to land.

Ariosto, *ahr yos′to,* LUDOVICO (1474–1533), a celebrated poet of Italy, born at Reggio, in Lombardy. His lyric poems in the Italian and Latin languages, distinguished for ease and elegance of style, introduced him to the notice of the Cardinal Ippolito d'Este, whose service he entered. The publication in 1515 of his immortal poem, the *Orlando Furioso* (Orlando Mad), made him at once highly popular. This poem details the chivalrous adventures of the paladins of the age of Charlemagne. Ariosto's other work includes severe satires in the spirit of Horace.

Arista, *a rees′ta,* MARIANO (1802–1855), a Mexican general. He took part in the war that established Mexican independence, and in 1836 was second in command to General Santa Anna. He commanded at Palo Alto and Resaca de la Palma, in the war between Mexico and the United States. In 1850 he became president of Mexico, but soon after his resignation in 1853 he was banished, and died in exile.

Aristides, *ar is ti′deez,* (surnamed *The Just*) (about 550–467 B. C.), a celebrated Athenian statesman and military commander. At the time of the Persian invasion under Darius, Aristides was one of the leaders of the Athenians. Owing to his influence and persuasion the chief command was given to Miltiades, instead of being changed daily among the ten generals, as had been customary. To this fact was due in great measure the important victory at Marathon (490). Shortly after this Aristides was appointed archon, but his rival, Themistocles, managed to secure his ostracism on the pretext that he was becoming dangerous to the democracy (484). In connection with this incident is told the familiar story of Aristides's writing his own name on the shell for an illiterate citizen who wanted to vote for his ostracism, and gave as his only reason that he was tired of hearing Aristides called *The Just.* Such was his unselfish patriotism that during his exile he sought to unite the Grecian cities against the coming Persian invasion, and before the Battle of Salamis (480) went to

Themistocles and gave him his hearty support. He assisted in planning the engagement and himself took part in it and afterward commanded the Athenian forces. When the Delian League was formed, he took the chief part in its organization. Aristides was so poor at his death that he was buried at public cost, but from a grateful country his children received dowries and a landed estate.

Ar′istip′pus, a disciple of Socrates, the founder of a philosophical school which was called the *Cyrenaic* school, from Cyrene, the native town of Aristippus. He flourished in 380 B. C. His fundamental principle was that all human sensations may be reduced to two, pleasure and pain.

Ar′istoc′racy. See GOVERNMENT.

Aristophanes, *ar′is tof′a neez,* (444–380 B.C.), the greatest comic poet of ancient Greece, born at Athens. He appeared as a poet in 427 B. C., and having indulged in some sarcasms on the powerful demagogue Cleon, was ineffectually accused by the latter of having unlawfully assumed the title of an Athenian citizen. He afterward revenged himself on Cleon in his comedy of *The Knights,* in which he himself acted the part of Cleon. His most important extant plays are *The Knights, The Clouds,* in which Socrates is ridiculed, *The Wasps, The Birds* and *The Frogs,* a satire on Euripides.

Ar′istot′le (384–322 B. C.), the greatest of ancient philosophers and the founder of the Peripatetic School of Philosophy. At the age of seventeen Aristotle went to study at Athens, where he remained for twenty years. He was a favorite pupil of Plato, who called him "the intellect of his school." About 343 Aristotle became the teacher of Alexander the Great. After the conquest of Persia, Alexander presented him with nearly a million dollars and aided Aristotle's scientific researches greatly by sending him a specimen of any plant or animal unknown in Greece that was found on his expeditions. This friendship led the Athenians to accuse Aristotle of favoring Macedonia, and he was forced to flee to Chalcis, on the island of Euboea, where he died.

While at Athens Aristotle taught in the Lyceum, a gymnasium near the city, and his school is sometimes referred to by this name. The name *Peripatetic* is due to the fact that he walked up and down in his garden while teaching. It was his custom to instruct his more intimate pupils in the problems of philosophy during the forenoon, and in the evening he gave public lectures to the people on less weighty subjects. Aristotle was the creator of natural science. He was the first to divide the animal kingdom into classes, and came near discovering the circulation of the blood. His moral and political philosophy is based on the peculiarities of the human organism. To him is due the syllogism, the simplest form that an argument may assume. He was the first to distinguish the substance of things from their accidental characteristics; that is, matter and form. He established the so-called "cosmological argument" for the existence of God. This is, in substance, that everything in the world has a finite cause, and back of the long succession of finite causes there must be an infinite being, a first something, absolute reason, God. Before the eleventh century Aristotle was but little known to the Christian world, although prized by the Arabians for three centuries prior to this. For four centuries he remained the authority of the Christian thinkers, but gradually his teachings became distorted and misunderstood. With the revival of learning his works were carefully studied and correctly interpreted, and their effect is felt in all subsequent philosophy, notably in Bacon, Kant, Spinoza and Descartes. Only a portion of Aristotle's writings have come down to us. Of his preserved works the most important are *Logic, Rhetoric, Poetics, Physics, Metaphysics, Ethics, Psychology, Politics, History of Animals, Meteorology.* See PERIPATETIC SCHOOL OF PHILOSOPHY; PHILOSOPHY; PLATO.

Arith′metic is that branch of mathematics which treats of the nature and properties of numbers and of computation by means of them. Arithmetic is the simplest branch of mathematics and the one most widely used. The number idea is an idea of relation and is therefore called abstract. It does not apply to objects themselves, but to the relation of magnitude which these objects sustain to one another, as the number idea in 3 blocks does not apply to the individual blocks but to the size of the group (See NUMBER). The idea of number is inborn and universal, though among uncivilized peoples it has been developed only to a limited extent, probably because their habits of life do not require any great use of numbers. In children this idea is manifest at an early age. The infant in its mother's arms learns the difference between one and two, and as soon as the child can move about he begins to count and measure, though as yet he knows nothing of numbers as used by older persons. Even without any attention from others, by the time he has reached school age the child has acquired some knowledge of numbers, and if he has been assisted this knowledge is very helpful to him as he begins the systematic study of the subject (See NUMBER, METHODS OF TEACHING).

NOTATION AND NUMERATION. There are two systems of writing and reading numbers in general use, known as the Roman and the Arabic. The first makes use of certain letters of the alphabet to indicate the numbers, as I, 1; V, 5; X, 10; L, 50; C, 100; D, 500, and M, 1000. In this system of notation a letter of less value placed before one of greater indicates that the value of the first letter is to be subtracted from the one following, as I before V for 4; X before L for 40. The multiplication of the quantity indicated is shown by repeating the letters, as XX for 20; CC for 200. Numbers between 1 and 10 are indicated by using the letters for addition, as VI, 6; VII, 7, or by subtraction as already mentioned. The Roman system is in use for numbering chapters in books, the orders of kings, as Edward VII, Christian IX, for indicating the larger divisions in a system of subdivisions or headings, and for a few other purposes.

The so-called Arabic system of notation is the one in general use throughout the world. It is supposed to have originated among the Hindus, by whom it was developed. This uses ten arbitrary symbols or figures which represent numbers from 0 to 9, inclusive. When standing alone, each of these symbols represents a definite value, as 4, 5; but when placed in combination with other figures its value depends upon the position which it occupies, as in two figures placed side by side, as two 5's, the left-hand figure has ten times the value of the right, and the number indicated is 55. This law is used throughout the Arabic notation; hence the system is written and read on the decimal scale. According to this scale, each place to the left of the point known as the decimal point has ten times the value of the number to its right, and each place to the right of the decimal point has one-tenth the value of the place to the left. This is shown in the following diagram, in which the double vertical line indicates the position of the decimal point.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Units	Tenths	Hundredths	Thousandths	Ten Thousandths	Hundred Thousandths	Millionths
7	6	5	4	3	2	1	1	2	3	4	5	6

In the oral reading of numbers the names of the first nine figures, from 0 to 9, inclusive, are given. Then the numbers are named in the order of the tens and units which they contain, as 11, 12, 13, and so on until 20, or two tens, is reached. The successive numbers from 20 to the next ten are indicated by the combination of the two tens with the necessary unit of figures, as 21, 22, and so on; hence, when one has learned the reading of numbers as far as 30, the only additional names to be learned between that number and 100 are those of the tens, 40, 50, 60 and so on. The same law holds in reading larger numbers, as hundreds, thousands, ten thousands, hundred thousands and millions, while on the right of the decimal point similar terms with the termination *th* or *ths* are used, as tenths, hundredths, thousandths; thus, the system is very simple and easily learned.

OPERATIONS. All operations in arithmetic rest upon one or more of the four so-called fundamental operations or rules—addition, subtraction, multiplication and division, one phase of the last including fractions. These operations are employed to answer the following questions:

1. How many single things (units) in two or more groups? (Addition.)
2. How many units are left from the number in the original group when a number has been taken away? (Subtraction.)
3. How many individuals are there in a given number of groups, each containing the same number of units, as, 3 groups of 5 or 4 groups of 6? (Multiplication.)
4. How many groups of a given number of units are there in the entire number of units, as, How many groups of 5 in 30? (Division, *a*.)
5. What part of the whole number of units is the number in a given group, as, What part of 20 is 5? (Division, *b*: Fractions.)

Common and decimal fractions deal with parts of wholes or units, and the operations with them are for the purpose of answering the same questions as in whole numbers; hence the same operations—addition, subtraction, multiplication and division—occur with fractions as with whole numbers, as, How much is $\frac{1}{5}$ and $\frac{1}{3}$? (Addition.) What is left after taking $\frac{1}{5}$ from $\frac{1}{3}$? (Subtraction.) What is $\frac{1}{2}$ of $\frac{3}{5}$? (Multiplication.) How many $\frac{1}{2}$'s in $\frac{3}{4}$? (Division.)

The reduction of fractions to equivalent fractions having a common denominator is for the purpose of reducing them to units of the same kind, and in no wise affects the operations described above, and short methods of operation, such as inverting the divisor in division, in no wise affect the fundamental rules and principles involved. Such operations simply lessen the labor necessary to obtain the result. In general they should not be used until the student thoroughly understands the principles and processes involved; that is, the student should not perform the operation in division of fractions by inverting the divisor until he understands that there is no difference in principle between dividing $\frac{3}{4}$ by $\frac{1}{2}$ and dividing 6 by 4. Decimals differ from common fractions only in form; since their denominators are 10 or some multiple of 10, the denominator is expressed by the decimal point (See diagram under *Notation and Numeration,* above).

The child who thoroughly masters the primary combinations of number, that is, all the additions from 1 to 9, inclusive, and all the multiplications from 1 to 12, inclusive, and also understands the use of the fundamental operations in answer to the five questions given above, has laid a good foundation for mastering the science of arithmetic.

However complicated an arithmetical problem may appear, its solution involves the answering of one or more of the five questions already explained, and when viewed from the point of these underlying principles, arithmetic is seen to be a comparatively simple science. The solution of problems lies in discovering the relations which the given numbers or quantities bear to one another, and these relations are readily found if only two numbers or quantities are considered at a time. The student of arithmetic should bear in mind that comparison can be made between two quantities only, and that the result derived from this comparison forms one of the quantities with which to make the next comparison, and the quantity thus obtained affords a means for making a third comparison, and so on until the desired result is obtained. Every problem presents three questions: What is given? What is required? How is the required quantity to be obtained? In the solution of the problem these questions should be considered in the order given.

Course of Study. In addition to the fundamental rules and principles already discussed, a course of study in arithmetic in elementary schools should contain the following divisions of the subject, and each should be pursued as far as it is used in common business:

1. Common weights and measures, including United States money.
2. Percentage and its elementary applications to interest, discount, profit and loss and insurance.
3. Simple proportion.
4. Measurements of surfaces and solids.
5. Practical estimates used by farmers, carpenters and jobbers.

The above divisions include nothing new except the number facts contained in the tables of weights and measures. The development of each division involves simply the application of the fundamental rules and processes to the conditions to which that branch of arithmetic particularly applies. All problems involving the use of large numbers and complex fractions and problems which partake of the nature of mathematical puzzles should be strictly excluded. The unreasonableness of the use of such numbers and problems is seen by a glance at the following table, which contains all the common fractions and their equivalent decimals used in ordinary business computations. To these should be added the decimals .06, .055 and .07, which have no equivalent common fractions of simple denominations:

COMMON FRACTION	EQUIVALENT DECIMAL	COMMON FRACTION	EQUIVALENT DECIMAL
$\frac{1}{2}$	.50	$\frac{5}{6}$	$.83\frac{1}{3}$
$\frac{1}{3}$	$.33\frac{1}{3}$	$\frac{1}{8}$	$.12\frac{1}{2}$
$\frac{2}{3}$	$.66\frac{2}{3}$	$\frac{3}{8}$	$.37\frac{1}{2}$
$\frac{1}{4}$	.25	$\frac{5}{8}$	$.62\frac{1}{2}$
$\frac{3}{4}$	.75	$\frac{7}{8}$	$.87\frac{1}{2}$
$\frac{1}{5}$	.20	$\frac{1}{12}$	$.08\frac{1}{3}$
$\frac{2}{5}$	.40	$\frac{5}{12}$	$.41\frac{2}{3}$
$\frac{3}{5}$	.60	$\frac{1}{16}$	$.06\frac{1}{4}$
$\frac{4}{5}$	.80	$\frac{3}{16}$	$.18\frac{3}{4}$
$\frac{1}{6}$	$.16\frac{2}{3}$	$\frac{5}{16}$	$.31\frac{1}{4}$

Results. A mastery of arithmetic should secure the following results:

1. Accuracy in computation. This is the first and most essential result to be obtained, for without it the others are of but little service.
2. Readiness in the use of numbers.
3. Ability to see relations clearly.
4. Ability to apply the principles and rules of arithmetic to the practical problems of life.

Importance. Arithmetic has always been considered one of the most important branches of study, and from the earliest times it has taken rank with reading and writing or language study. While without doubt in some instances too much time has been devoted to the subject, and phases of it which were entirely unnecessary have been pursued at the expense of more valuable information, yet too high an estimate can scarcely be placed upon the essentials of arithmetic. It is necessary for the self-protection of every one who mingles in society. Without it, computations necessary to enable one to know when he receives his just dues and to place the proper value upon services and property cannot be made. It is of importance to the young man or young woman who wishes to engage in business in any form, for without it success is impossible. It is also one of the best subjects to afford a mental training which includes careful and quick observation and systematic development of the reasoning powers. For methods of instruction, see NUMBER, METHOD OF TEACHING.

Ar'izo'na, a state in the southwestern part of the United States, bounded on the n. by Utah, on the e. by New Mexico, on the s. by Mexico and on the w. by California and Nevada. The Colorado River forms most of the western boundary. The length and breadth are about equal, being, respectively, 350 miles. The area is 113,020 sq. mi. Population in 1910, 204,354.

SURFACE. Detached mountains pass through Arizona from the southeast to the northwest and divide it into two parts, which are nearly equal in area. The northeastern portion consists of a high plateau, upon which rise isolated ranges and detached buttes and mesas (See BUTTE; MESA). The plateau is studded with hills and cut by deep canyons, through which in former ages streams of considerable magnitude flowed. The present streams are superficially dry a good portion of the year. Many of them have considerable and regular underflow available by pumping for irrigation. The Grand Canyon of the Colorado River, which is the most remarkable gorge in the world (See COLORADO RIVER, THE), runs across the northwestern part of Arizona and along its western boundary. The southwestern part slopes from the central mountain ranges toward the Gila River, which flows across the southern portion. Its general elevation is lower than that of the northern and northeastern portions, and it is marked by occasional buttes and mesas, which rise abruptly from the plains. Most of the southern half is noted for its desert-like appearance. The Gila has a few shallow tributaries, but they are dry, save for underflow, a large part of the year.

CLIMATE. The climate is unusually dry and healthful. The elevation of the northern half of the territory gives a mean annual temperature of about 45°. The southern half is intensely hot during the summer and has a mean annual temperature of about 70°. Throughout the country the rainfall is light. In the northern half it averages about 20 inches annually and in the southern half only 8 or 10 inches. For this reason vegetation is scant and consists largely of bunch grass, various species of cactus, mesquite, greasewood and other forms which are common to arid regions. In the regions above 5000 feet, in the northern and southern sections, are valuable pine forests.

MINERAL RESOURCES. Arizona is rich in minerals, and for many years has been the seat of mining occupations. Gold, silver, copper, coal, lead and a number of varieties of stone valuable for building and ornamental purposes exist in large quantities, but as yet mining operations have been confined to gold, silver, lead and copper. The copper industry is by far the largest, and Arizona ranks as the first state in the production of this metal, being approached only by Montana, the production of 1908 being 290,000,000 pounds. The output of gold averages about $2,730,000 a year, and the output of silver, about $1,127,000. Some of the mines in this region have been worked since the time of the early Spanish occupation of Mexico. In the northeastern part, near Holbrook, is found a remarkable collection of petrified trees, known as the petrified forest. The rock thus formed takes a high polish, presents a beautiful variegated appearance and is highly valued for ornamental purposes. Precious stones, including the opal, the garnet and the sapphire, are also found, and there are valuable quarries of onyx and marble, though these have not yet been worked to any extent.

AGRICULTURE. Lack of moisture has restricted agriculture to stock raising in those regions where grazing is possible and to intensified farming in the irrigated districts. Sheep and cattle are raised in large numbers, and Arizona is one of the leading states in the production of wool. Along the valley of the Gila River and on some of its tributaries irrigation has been practiced with great success. Here citrus fruits, olives, grapes and other products common to a semitropical region are raised with little effort. Alfalfa is also an important crop. Irrigation is also practiced around Phoenix with especial success, and the Roosevelt Dam, constructed by the government, will, when completed, impound water sufficient to irrigate about 300,000 acres (See IRRIGATION). It is estimated that Arizona has between 1,000,000 and 2,000,000 acres which can be irrigated with profit. Manufacturing is confined chiefly to lumber, beet sugar and dairy products.

Transportation. The Colorado River is navigable The Southern Pacific Railroad crosses Arizona from east to west in the southern part, with important branches to Globe, Nogales (connecting with the great West Coast system in Mexico), and to Phoenix and Winkelman; the Santa Fé system crosses the northern part, with branch lines to the Grand Canyon from Williams, to Prescott and Phoenix from Ashfork, and westward from Phoenix to the Colorado at Parker and to Los Angeles; and the El Paso & Southwestern system extends from Benson on the Southern Pacific southeast to Bisbee, Douglas and El Paso, with connections into Mexico. The settled portions of Arizona are along these railroads, which furnish excellent direct connections with the Pacific Coast and with the centers of trade in the east and northeast.

Education. Arizona maintains a thoroughly organized system of public schools, including twelve high schools. The University of Arizona at Tucson, normal schools at Tempe and Flagstaff and the industrial (reform) school at Benson are the chief educational institutions. The enrollment in the public schools is more than 29,000, and the expenditures for maintenance about $700,000 per year. The Roman Catholic Church maintains schools at Tucson, Phoenix, Prescott and Bisbee.

Institutions. The asylum for the insane is located at Phoenix; the prison, at Florence, where new and modern buildings have just been completed; the Home for Aged and Infirm Arizona Pioneers, at Prescott; the Arizona Fair, with extensive grounds and permanent buildings owned by the commonwealth, at Phoenix.

Cities. The chief cities and towns are Phoenix, the capital, Tucson and Prescott, described by title; Bisbee, Douglas, Globe, Jerome, Clifton and Morenci, important mining towns; Yuma, Tempe and Mesa, in the fertile irrigated districts.

History. Arizona was first visited by the Spaniards in 1539, but it had long been the seat of a race of natives whose ruins of villages and fortifications still remain. The hostility of the Indians retarded settlement, and revolutionary disorders in Mexico in the first half of the 19th century led to the abandonment of most of the mines and settlements except Tucson and Tubac. The territory was acquired at the close of the Mexican War by the treaty of 1848, and by the later treaty of 1853 (See Gadsden Purchase). It was governed as a part of New Mexico until 1863, when it became an independent territory. Frequent Indian uprisings, especially of the Apaches, greatly interfered with development, the last one occurring in 1896. With the extension of railroads into Arizona, the growth of great mining centers and the opening up of irrigated lands, progress has been rapid. As a consequence, demands for the admission of the territory as a state have been insistent, and in 1910 an enabling act was passed by Congress and became a law.

Arizona, University of, the only institution of college rank in Arizona, is a co-educational university, established by an act of the legislature in 1885, and is located at Tucson. It has over 200 students. The departments include the School of Mines, the Agricultural and Mechanical College, the Agricultural Experiment Station and a preparatory department. The library contains 15,000 bound volumes. The income of the university amounts to about $130,000 per year.

Ark, a word applied in the Bible to three objects: (1) The vessel in which Noah, his family and various animals were preserved during the flood (*Gen.* vi). (2) The basket of bulrushes which the mother of Moses made to preserve her infant son from death (*Exod.* ii). (3) The ark of the covenant, an article in the tabernacle and afterward in Solomon's temple at Jerusalem (*Exod.* xxv, 10–22; xxvii, 1–9).

Arkansas, *ahr'kan saw*, the *Bear State*, in the south central part of the United States, bounded on the n. by Missouri, on the e. by Missouri, Tennessee and Mississippi, from which it is separated by the Mississippi River; on the s. by Louisiana and on the w. by Oklahoma. The length is about 250 miles and the average width is 225 miles. The area is 53,850 square miles. Population in 1910, 1,574,449.

Surface and Drainage. The eastern part of the state bordering on the Mississippi is low and marshy, with occasional high bluffs. The surface rises to the westward in the central portion of the state, where undulating features are found. Beyond these to the west and northwest is a region crossed by numerous ranges of hills and low mountains, having a general trend from east to west. Spurs of the Ozark Mountains occur in the northwestern part of the state. The most important ranges are the Black Hills on the north, the Ouachita Hills on the south and the Cane Hills in the northwest. All these ranges are low, the highest point not exceeding 2800 feet. They are a continuation of the elevation in Oklahoma on the west and Missouri on the north.

The Arkansas River divides the state into two nearly equal divisions, and with the exception of two ranges of hills extending south and west through the central and western portion, all that part of the state south of this river consists of lowland. The other important streams are the White, flowing southward through the northeastern part of the state and entering the Mississippi just above the Arkansas; the Black and Cache, which are important northern tributaries of the White; the Salina, which drains the northwestern portion and the Ouachita, which drains the south central portion. There are numerous marshes and bayous along the Mississippi, but the state contains no lakes of importance. The fertile lowlands along the Mississippi are protected by an extensive system of dykes or levees. (See LEVEE.) But notwithstanding this protection, some of these lowlands are subject to occasional overflow during periods of high water. This, however, does not prevent their occupation for agricultural purposes.

CLIMATE. The lowlands have a hot and in a few sections unhealthful climate, but the northern and northwestern part, especially in the mountainous and hilly region, has a very mild and pleasant climate. This region is not subjected to severe north winds or long drought. Because of this, the Ozark region of Arkansas has attained a wide reputation as being beneficial to persons afflicted with lung diseases. The annual rainfall ranges from 40 inches in the north to 55 inches in the south.

MINERAL RESOURCES. Extensive beds of coal are found in the counties lying along both sides of the Arkansas River. These deposits furnish bituminous coal of an excellent quality and also a harder variety sometimes known as semi-anthracite. In other locations in the eastern part of the state lignite is found. In the mountainous regions are rich deposits of lead ore, also of the ores of zinc, copper and manganese. Marble is found in the north and slate, granite, kaolin, novaculite, a valuable hone-stone, and schists suitable for grindstones are also present. There are also extensive deposits of bauxite or aluminum ore. This is now being mined in large quantities.

AGRICULTURE. Arkansas is almost exclusively an agricultural state, and more than half of its area is in farms. North of the Arkansas River and in the higher altitudes grains, including wheat and corn, and fruits common to the temperate latitudes are grown. The northwestern portion of the state has attained a wide reputation for the excellent quality of its apples, peaches and strawberries. In the northeastern portion the soil is light and sandy and not very productive. Along the lowlands of the Mississippi and in the bottom lands south of the Arkansas lies the cotton belt, which yields the largest crops of any section of the state under tillage. Cotton is the most important crop and Arkansas now ranks as the fifth state in the production of this staple. Livestock is raised in considerable quantities in the northern and northwestern portion of the state, but stock raising is not one of the leading industries.

MANUFACTURES. The forests of Arkansas exceed in area the entire State of Indiana. They contain a large variety of both hard and soft woods valuable for lumber; consequently, the manufacture of lumber and lumber products, such as door and window casings, sash, blinds and other interior finishings, exceeds in extent and value any other manufacturing industry. There are numerous flour mills, and the manufacture of cotton-seed oil and cake is quite extensive.

TRANSPORTATION. The Mississippi gives the eastern portion of the state ready access to the sea and to all states with which the Mississippi is connected by navigable tributaries. The Arkansas is navigable across the entire state, and the Ouachita, in its lower course, for about two-thirds of the year. During high water the Saint Francis, Black and White rivers are also navigable. These streams greatly facilitate transportation and assist commerce. Important railway lines extend across the state from northwest to southwest and from east to west. While railroad building in Arkansas has not been as extensive as in some other states, there are now enough lines to connect all of the important towns. The railroads are under the supervision of a state railroad commission, which has the authority to regulate rates. The commerce of the state finds an outlet through Memphis and New Orleans. The exports are cotton, lumber and the products of the various mines and quarries, while the imports are manufactured articles and such food products as are not grown within the state,

GOVERNMENT. The right of suffrage is restricted to those who have resided in the state a year, the county six months in and the precinct or ward one month, and who have paid poll tax. Elections are held every other year. The legislative department consists of a senate of 35 members and a house of representatives, which cannot exceed 100 in number. The members of the house are elected for two years, and the senators serve four years. The governor, secretary of state, treasurer, auditor and attorney general constitute the executive department of government, and each is elected for a term of two years. The judiciary system consists of a supreme court, a number of circuit courts and a probate and county court for each county. Justice courts are also established in the townships. The local government is in the hands of county and township officers.

Education. The state has a public school fund of about $1,500,000, and as the resources and industries continue to develop this will be increased. Because of the large rural population, graded schools are confined to the larger towns, and all schools are more or less dependent upon local taxation for support. Since 1900 there has been marked progress in educational matters among both the white and the colored population. There is a state university at Fayetteville which maintains a normal and training department. There are also a number of sectarian colleges and schools of secondary grade for both white and colored pupils, and the instruction given in some of these includes manual training and household arts.

Institutions. The state penitentiary and the state institutions for the blind and deaf are located at Little Rock. The state also maintains a hospital for the insane and a penitentiary in Pulaski County.

History. The first settlement in the territory of Arkansas was by the French, at Arkansas Post, in 1685, and little advance was made until the territory came into the possession of the United States by the Louisiana Purchase in 1803. It was governed as a part of the Territory of Louisiana until 1812; as a part of the Territory of Missouri until 1819; as an independent territory, including Indian Territory, until 1836, when the present state was formed. At the outbreak of the Civil War the state was about evenly divided on the question of secession, but an influx from the Southern states led the state to secede on May 6, 1861. It adopted a new constitution, prohibiting slavery, in 1864, but was not admitted until 1868, delay being caused by the Congressional policy of reconstruction. Another constitution was adopted in 1874. Since 1876 the state has made rapid progress, especially in the development of its mining industries.

Arkansas, a river of the United States, rising in Colorado and flowing through Kansas and Oklahoma and across Arkansas into the Mississippi River. It is the largest tributary of the Mississippi excepting the Missouri. Its length is 2170 miles, it is navigable for about 650 miles, and it drains an area of 188,000 square miles. In its upper course in Colorado, it flows through the Royal Gorge, one of the most remarkable canyons in the country.

Arkansas, an indian tribe. See Quapaw.

Arkansas, University of, a state institution established in 1872. The academic and technical departments are located in Fayetteville; the law and medical departments in Little Rock, and the Normal School, which is for colored students, at Pine Bluff. The combined schools number about 150 professors and instructors, and about 1800 students.

Arkansas City, Kan., a city of Cowley co., 55 mi. s. e. of Wichita, on the Atchison, Topeka & Santa Fé, the Missouri Pacific and other railroads. It is near the junction of the Arkansas and Walnut rivers. A canal connecting the two streams furnishes power for manufacturing, which is the principal industry. The products include flour, lumber, windmills, carriages and ice. A United States Indian School is located here, and the city has two parks. The place was settled in 1870 and incorporated the following year. The municipality owns and operates the waterworks. Population in 1910, 7508.

Ark'wright, Sir Richard (1732–1792), an English inventor, born at Preston, Lancashire. His early education was very meager, and at the age of thirteen he was apprenticed to a barber. From living in a place where cotton-spinning was the chief industry, he early became interested in the processes used in cotton manufacture. At that time cloth was made with a linen warp, as no way had been found to spin cotton fit for a warp. Arkwright invented a spinning jenny that transformed the cotton rolls from the carding machine into fine, hard-twisted thread, suitable for warp. His first machine was set up at Preston, but he was obliged to leave this place on account of the prejudice of the spinners against such a labor-saving machine, and he moved to Nottingham where he became associated in partnership with Mr. Strutt and Mr. Reed, who helped him to secure a patent for his invention. In 1769 he set up his first mill and later built a larger factory. Arkwright may be called the founder of the factory system. See SPINNING; FACTORY AND FACTORY LEGISLATION.

Arlberg, *ahrl'berg,* **Tunnel,** a tunnel constructed through the Arlberg Pass in Austria. The tunnel is situated between Sanct Anton and Langen, and has a total length of six and one-half miles. The highest point is 4260 feet above sea level, and the total cost was $7,500,000. It is used by the railway from Innsbruck to Bludenz.

Arles, *ahrlz,* a town of southern France, 44 mi. n. w of Marseilles. It is one of the oldest towns of southern France, having been an important town at the time of Caesar's invasion, and under the later emperors it became one of the most flourishing towns on the further side of the Alps. It still possesses numerous ancient remains, of which the most conspicuous are those of a Roman amphitheater. Population in 1901, 28,573.

Ar'lington, MASS., a town in Middlesex co., 6 mi. n. w. of Boston, on the Boston & Maine railroad. It is a residence suburb and has a fine public library. Market gardening and the manufacturing of ice-cutting tools are the chief industries. The place was settled in 1650, was incorporated as West Cambridge in 1807 and was given its present name in 1867. Population in 1910, 11,187.

Arlington, a small village of Alexandria co., Va., on the Alexandria & Mount Vernon electric railway, 5 mi. n. w. of Alexandria and 3 mi. from Washington. The village is noted for the national cemetery, which occupies the site of the former residence of Robert E. Lee, seized during the Civil War.

Arm. See JOINTS; SKELETON.

Arma'da, the Spanish name for any large naval force, usually applied to the fleet designated the *Invincible Armada,* intended to act against England in 1588. It was fitted out by Philip II, partially to avenge the death of Mary Queen of Scots, and consisted of 130 great war vessels, with over nineteen thousand soldiers and eight thousand sailors, all under the command of the duke of Medina Sidonia. The fleet had scarcely quitted Lisbon on May 29, 1588, when it was shattered by a storm, and had to be refitted in Corunna. It was to coöperate with a land force collected in Flanders under the prince of Parma, and, to unite with this, it proceeded through the English Channel toward Calais. In its progress it was attacked by the English fleet under Howard, Drake, Hawkins and Frobisher, and the great lumbering Spanish vessels suffered severely from their smaller opponents, which eluded most of the Spanish fire. Driven close to Gravelines, the armada was becalmed and was thrown into confusion by fire-ships. The duke of Medina Sidonia, owing to his severe losses, at last resolved to abandon the enterprise, and conceived the idea of reconveying his fleet to Spain by a voyage round the north of Great Britain; but storm after storm assailed his ships, scattering them in all directions and sinking many. Some went down on the cliffs of Norway, others in the open sea, others on the Scottish coast. Only about fifty vessels arrived in Spain.

Ar'madil'lo, a toothless mammal, found in South America. Armadillos are covered with a hard, bony shell, divided into belts, composed of small separate plates like those of a coat of mail, flexible except on the forehead, shoulders and haunches, where it is not movable. The belts are connected by a membrane, which enables the animal to roll itself up like a hedgehog. These animals burrow in the earth, where they lie during the daytime, seldom going abroad except at night. They are of different sizes, the largest being three feet in length, not including the tail, and the smallest only ten inches. They subsist chiefly on fruits and roots, sometimes on insects and flesh. They are inoffensive and their flesh is esteemed as food. Armadillos are sometimes known as ant-eaters (See ANT-EATER).

ARMADILLO

Ar'mature, a term applied to the piece of soft iron which is placed across the poles of permanent or electro-magnets for the purpose of receiving and concentrating the attractive force. In the case of permanent magnets, it is also important for preserving their magnetism when not in use, and hence is sometimes termed the *keeper.* It produces this effect in virtue of the well-known law of induction, by which the armature, when placed near or across the poles of the magnet, is itself converted into a temporary magnet with reversed poles, and these, reacting upon the permanent magnet, keep its particles in a state of constant magnetic tension.

A horseshoe magnet should therefore never be laid aside without its armature; and, in the case of straight-bar magnets, two should be placed parallel to each other, with their poles reversed, and a keeper or armature across them at both ends. The term is also applied to the core and coil of the electro-magnet, which revolves before the poles of the permanent magnet in the magneto-electric machine. See MAGNET; ELECTRO-MAGNETISM.

Arme′nia, an ancient kingdom of western Asia which formerly occupied the region from the Caucasus Mountains on the n. to Cappadocia on the w. and s. w. and extended e. as far as the Caspian Sea The boundaries varied widely at different periods of its history. The greater part of the region is a mountainous plateau, partially surrounded by the Taurus and Anti-Taurus mountains, and containing other mountains, chief of which is Ararat, a volcanic peak over 17,000 feet high (See ARARAT). The country was divided into Armenia Major and Armenia Minor, the former occupying the eastern part and the latter the western part of the territory. Armenia Minor is drained by the Tigris and Euphrates rivers, and the Aras or Araxes flows across the northern part of Armenia Major into the Caspian Sea, while the Halys flows northward into the Black Sea.

Armenia is in every way well adapted to agriculture. It has fertile corn lands and broad pastures, and its valleys produce cotton, rice, tobacco, grapes and dates. In the forests are found the ash, maple, oak, walnut, chestnut and pine. There are no manufactures of great importance. The country is rich in minerals, which include silver, lead, iron and copper.

The greater portion of the inhabitants are of the ancient Armenian stock, a branch of the Aryan or Indo-European race, but there are also found many Turks, Kurds and other nationalities, owing to the repeated subjugation of the country by these nations. The Armenians call themselves *Haiks*, from Haig or Haicus, the founder of the kingdom, whom they consider to be the grandson of Noah. In all, they number about 2,000,000, one-half of whom are in Armenia, and the remainder of whom are, like the Jews, scattered over the earth. Wherever they go the Armenians maintain their language, domestic and social customs and religion. They have keen intellects, but, owing to the oppressive government under which they live and the lack of schools, most of them are grossly ignorant.

HISTORY. Armenia was the Ararat of the Scriptures, and the Urartu of the Assyrians, by whom it was conquered as early as the eighth century. It was conquered by Alexander the Great in 325 B. C., and for the next one hundred and fifty years was subject to the Macedonians or Syrian-Greeks. It regained its independence about 190 B. C., when it was divided into Armenia Major and Armenia Minor, each administered under a separate government. Under Tigranes the Great, son-in-law of Mithridates, the country was conquered by the Romans in 69 B. C. and was made a tributary province. In the latter part of the fourth century, it was partitioned between Persia and the Byzantine Empire.

The old religion of the country was Zoroastrianism. Christianity was introduced in 285 by Gregory the Illuminator. The new creed rapidly gained ground, and the Armenians are accredited with establishing the first Christian church in the world. The attempt of the Persian rulers to overthrow Christianity plunged the country into war and anarchy, but the Armenians held to their faith. Three hundred fifty years later the Arabs secured control of the country, and the next two and a half centuries were marked by conflicts between the Christians and Mohammedans. After the latter half of the ninth century, the country enjoyed a period of tranquillity which lasted for one hundred years. Armenia was invaded in succession by the Byzantines, Mongols and Seljuk Turks, and it was finally divided between the Byzantines and Timur. In 1472 it was conquered by the Persians, and in 1828 a portion of that under Persian control was seized by Russia. The ancient kingdom is now divided between Turkey, Russia and Persia. By the treaty of 1878 (See BERLIN, CONGRESS OF), the powers of Europe guaranteed the integrity of the Turkish Empire, and since that time the conditions of Armenia have remained unchanged.

In 1885 the Armenians attempted a revolutionary movement, but were put down by the Kurds, or Turkish soldiers, with the greatest cruelty. Frequent massacres have occurred since that time, and in 1895–1896 the suffering of the people aroused the nations of Europe, as well as the United States. A joint commission was sent to Constantinople to remonstrate with the Turkish government. Reforms were promised, but they have never been carried out, though the indiscriminate massacres have been less frequent.

Armin'ius (18 B. C.–about 20 A. D.), a German hero, celebrated as the deliverer of his country from the Roman yoke. He completely annihilated the army of Varus, consisting of three legions, in a three days' battle fought in the Teutoburg forest After many years' resistance to the power of the empire, he drew upon himself the hatred of his countrymen by aiming at the regal authority, and was assassinated.

Armistice, *ahr'mis tis*, a mutual agreement to suspend hostilities, between two armies or nations at war. It is generally proposed when an endeavor to form a treaty of peace is being made, and sometimes when both parties are exhausted. The desire for an armistice for a temporary purpose—such as to bury the dead after a battle—is indicated by the hoisting of a white flag.

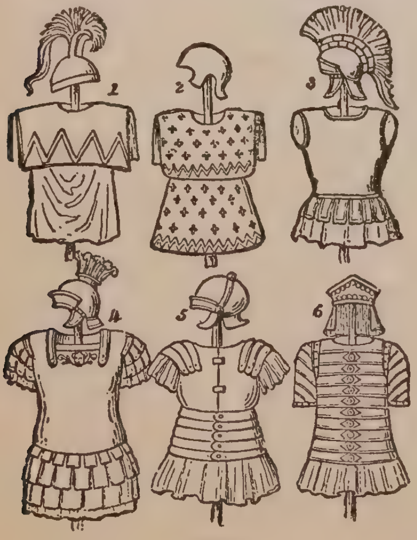
Armored Ship. See WAR SHIP.

Ar'mor Plate, strong sheets of iron or steel with which war ships are covered as a protection against torpedoes and cannon. The real beginning of the use of armor plate in naval battles was seen in the famous combat between the *Monitor* and the *Merrimac* in Hampton Roads in 1862. From that time to the present it has been a constant struggle between inventors of guns and armor as to which should excel. Wrought iron plates were soon proved vulnerable to the chilled steel projectiles of rifled cannon, and combined plates welded or separated by layers of wood were tried. Now different varieties of steel are combined in one plate, in such a way that a hard surface is presented to break or injure the projectile, and a tough composition which will not seriously crack or break loose forms the inner part of the plate. In the United States the principal manufacturers of armor plate are the Carnegie Steel Company at Pittsburg and the Bethlehem Steel Company at South Bethlehem, Pa. The process of manufacture is a complicated one, and requires constant work for about nine months on a single plate, the cost of which exceeds $400 per ton. A finished plate is rarely more than 9 by 18 feet in extent or more than a foot thick. Teakwood of considerable thickness is placed between the iron frame of the ship and the armor plate to lessen concussion. It is no longer thought possible to make a ship that is invulnerable to all kinds of cannon shot, for a modern steel-capped projectile will pierce the strongest Krupp armor to a depth of from one to one and a half times the diameter of the shot (See CANNON); but the effort is to prevent explosive shells from entering the ship and to protect the vital parts. Ships often carry as much as 4000 tons of armor distributed most thickly over the engines and big gun turrets.

Ar'mour, PHILIP D. (1832–1901), an American merchant and philanthropist, one of the founders and long the head of the firm of Armour & Co., the largest pork-packing and dressed-meat establishment in the world. He was born at Stockbridge, N. Y., went to California in 1852, engaged in the wholesale grocery business in Milwaukee, Wis., in 1856, and in 1863 joined his brother, Herman O., and others, in the pork-packing business under the name Armour, Plankinton & Co. He founded in Chicago the Armour Mission, Armour Flats and Armour Institute, the last an important technical school with property now valued at nearly $5,000,000, and an attendance of about 1000.

Arms and Armor. ARMS. This term is applied to weapons of offense. The first were probably wooden clubs, and these were followed by wooden weapons made more deadly by means of stone or bone, stone axes, slings, bows and arrows with heads of flint or bone, and afterward various weapons of bronze. Subsequently, iron and steel arms of various kinds were introduced, comprising the sword, javelin, pike, spear or lance, dagger, axe, mace, chariot scythe, and with a rude artillery consisting of catapults and battering-rams. From the descriptions of Homer we know that almost all the Grecian armor, defensive and offensive, in his time was of bronze, though iron was sometimes used. The lance, spear and javelin were the principal weapons of this age among the Greeks. The bow is not often mentioned. Among ancient nations the Egyptians seem to have been most accustomed to the use of the bow, which was the principal weapon of their infantry. Peculiar to them was a defensive weapon intended to catch and break the sword of the enemy. With the Assyrians the bow was a favorite weapon; but with them lances, spears and javelins were in more common use than with the Egyptians. Most of the large engines of war seem to have been of Assyrian origin. During the historic age of Greece the characteristic weapon was a heavy spear from 21 to 24 feet in length. The sword used by the Greeks was short and was worn on the right side. The Roman sword was from 22 to 24 inches in length, straight, two-edged, and obtusely pointed, and, as by the Greeks, was worn on the right side. It was used principally as a stabbing weapon. It was originally of bronze. The most characteristic weapon of the Roman legionary soldier, however, was the *pilum*, which was a kind of pike or javelin, 6 feet or more in length. The pilum was sometimes used at close quarters, but more commonly it was thrown. The favorite weapons of the ancient Germanic races were the battle-axe, the lance or dart and the sword. The weapons of the Anglo-Saxons were spears, axes, swords, knives and maces or clubs. The Normans had similar weapons, and were well furnished with archers and cavalry. The crossbow was a comparatively late invention, introduced by the Normans. Gunpowder was not used in Europe to discharge projectiles till the beginning of the fourteenth century. Cannon are first mentioned in England in 1338, and there seems to be no doubt that they were used by the English at the siege of Cambrai in 1339. Hand firearms date from the fifteenth century. The only important weapon not a firearm that has been invented since the introduction of gunpowder is the bayonet, which is believed to have been invented about 1550. (See CANNON; MUSKET; RIFLE, and articles on other weapons.)

ARMOR. Some kind of defensive covering was probably of almost as early invention as weapons of offense. The principal pieces of defensive armor used by the ancients were shields, helmets, cuirasses and greaves. In the earliest ages of Greece the shield is described as of immense size, but in the time of the Peloponnesian War (about 420 B. C.) it was much smaller. The Romans had two sorts of shields: the *scutum*, a large, oblong, rectangular, highly convex shield, carried by the legionaries; and the *parma*, a small, round, or oval, flat shield, carried by the light-armed troops and the cavalry. In the declining days of Rome the shields became larger and more varied in form. The helmet was a characteristic piece of armor among the Assyrians, Greeks, Etruscans and Romans. Like all other body armor, it was usually made of bronze. The helmet of the historical age of Greece was distinguished by its lofty crest. The Roman helmet in the time of the early emperors fitted close to the head, and had a neck-guard, hinged cheek-pieces fastened under the chin, and a small bar across the face for a visor. Both Greeks and Romans wore cuirasses, at one time of bronze, but latterly of flexible materials. Greaves for the legs were worn by both, but among the Romans usually on one leg only. The ancient Germans had large shields of plaited osier covered with leather; afterward their shields were small, bound with iron and studded with bosses. The Anglo-Saxons had round or oval shields of wood, covered with leather, with a boss in the center; and they had also corselets, or coats of mail, strengthened with iron rings. The Normans were well protected by mail; their shields were somewhat triangular in shape, their helmets conical. In Europe generally, metal armor was used from the tenth to the eighteenth century, and at first consisted of a tunic made of iron rings firmly sewed flat upon strong cloth or leather. The rings were afterward interlinked one with another so as to form a garment of themselves, called *chain-mail*. Great variety is found in the pattern of the armor, and in some cases small pieces of metal were used instead of rings, forming what is called *scale-armor*. Larger pieces of metal were fastened together to make *plate-armor*, which gradually superseded the other forms and continued to be worn until long after the introduction of firearms and field artillery. A complete suit of armor was an elaborate and costly equipment, consisting of a number of different pieces, each with its distinctive name. In modern European armies the metal cuirass is still to some extent in use, the *cuirassiers* being heavy cavalry; and it is said that this piece of armor proves a useful defense against rifle bullets. During all the time that the use of heavy armor prevailed, the horsemen, who alone were fully armed, formed the principal strength of armies, and infantry, except in



ARMOR
1, 2, Early Greek; 3, Greek; 4, 5, Roman; 6, Barbarian.

England, was generally regarded as of little account.

Arm'strong, John (1758–1843), an American soldier, born in Carlisle, Pa. He served in the colonial army in various positions, but is chiefly remembered as the author of the Newburgh Addresses, which were circulated among the colonial officers in March, 1783, urging the troops not to lay down their arms until they had been paid by Congress. At its appearance this notice was anonymous, but Armstrong afterward confessed that he wrote it. He served later in various diplomatic and military offices.

Armstrong, Samuel Chapman (1839–1893), an American educator, born at Wailuku, Hawaiian Islands. He was a son of an American missionary, and was educated at Oahu College, Honolulu, and Williams College, Massachusetts. He entered the Union army, served during the Civil War and was mustered out with the rank of brigadier general of volunteers. On leaving the army, he was associated with General O. O. Howard in the Freedmen's Bureau, and during the two years in which he was engaged in this work matured a careful plan for educating negroes. He then enlisted the aid of the American Missionary Association and numerous friends in the North and founded Hampton Normal and Agricultural Institute. To the establishment and work of this school he devoted the remainder of his life. See Hampton Normal and Agricultural Institute.

Armstrong, William George (1810–1900), an English mechanical engineer and inventor. He began the study of law, but a strong interest in scientific work led him to devote himself to that field. Among his early inventions were the hydro-electric machine and the hydraulic crane. In 1846 he founded the Elswick works for the construction of this machinery, and these works are now among the most extensive of their kind. In 1854 he invented the rifled ordnance gun (See Armstrong Gun), which bears his name, and on presenting his patents to the British government he was knighted and appointed engineer of rifled ordnance. Cambridge and Oxford conferred honorary degrees upon him, and in 1887 he was made a peer.

Armstrong Gun, a kind of cannon, so-called from its inventor, made of wrought-iron, principally of spirally-coiled bars, so disposed as to bring the metal into the most favorable position for the strain to which it is to be exposed, and occasionally having an inner tube or core of steel, rifled with numerous shallow grooves. The size of these guns ranges from the smallest field-piece to pieces of the largest caliber, and both breech-loading and muzzle-loading guns are made. The projectile is coated with lead, which, compressing its soft coating into the grooves, gives the bullet a swift rotary motion. See Armstrong, William George.

Ar'my, a body of armed men, so organized and disciplined as to act together, be mutually reliant and perform in unison the evolutions of the march and battlefield, according to the absolute will of one man.

Ancient Armies. The earliest regular military organization is attributed to Sesostris, who flourished in Egypt about sixteen centuries B. C. From his time till that of the Persian Empire but little progress was made. After the destruction of the powerful army of Xerxes, the Greeks were the first military nation, but they in time fell before the Romans, among whom every adult male was obliged to undergo severe drill and discipline in the army, from the age of seventeen to forty-six. The Roman legion at its best excelled all other troops in spirit and discipline.

Medieval Armies. The Middle Ages marked the disappearance of national armies, as the support of the feudal system required the organization of small bodies of troops devoted to the barons and overlords. Organized battles on a large scale were rarely fought, and often the struggle resolved itself into a combat between individual knights.

Modern Armies. Notwithstanding the enormous improvements brought about by the Spanish-American War, the Boer War and the conflict between Russia and Japan, comparatively few changes have been made in army organization, and those only such as modern inventions have made necessary. The use of long range, rapid-fire cannon, rifles of great power, railroads for transporting troops even up to the line of battle, and the telephone in place of the mounted orderly for the transmission of commands even in the face of the enemy, have made possible a much more extended battle front. In the Battle of Mukden, for example, troops were engaged along a line of over one hundred miles in length, and what in other times would have been a series of battles, disconnected in plan and bearing little immediate relation to one another, became one tremendous engagement requiring days for maneuvering. Different methods of intrenching, a wise use of rough country for protection, skirmish lines of single rank and infantry mounted so that they can be moved rapidly over long distances and then dismounted for fighting, are all modern developments. Search lights, automobiles, war balloons, range finders and a host of other appliances have added to the complexity of army organization, while improvements in firearms and explosives have added infinitely to the possibilities of destruction. But the principles of disabling the enemy without permanent injury, and of using weapons that will not create unnecessary suffering, have been generally accepted. Advance in sanitary science and improvements in the care for armies in the field have lessened materially the horrors of old-time warfare. In the Russo-Japanese war the cases of illness and incapacity for duty from any other cause than wounds or accident were so few as to be the subject of world-wide comment.

United States Army. By the Constitution of the United States, the president is made commander in chief of the army and navy of the Union, and Congress has power to raise and support armies, to regulate them and to provide for executing the laws of the Union, suppressing insurrections and repelling invasions. The military history of the United States begins with the army of Washington, and the growth has been spasmodic. The colonies in the Revolution enrolled 300,000 men in all. In 1790 the army as fixed by act of Congress consisted of 1216 men. In 1861, at the commencement of the Civil War, the regular force amounted to only 14,000 men. In April of that year President Lincoln called out 75,000 volunteers for three months. The total number of men in the army between April, 1861, and April, 1865, amounted to 2,759,050. The Southern States during this time raised an army of about 1,100,000 men, and thus in the whole United States was raised the enormous army of nearly 4,000,000 men. The army reorganization bill passed by Congress in 1901 provided for a standing army of 58,000 men as the minimum, but the president is empowered to raise it to 100,000 if necessary. The army previously was limited to 25,000 men. The United States is divided into the following military departments: Department of the East, headquarters, Long Island, New York harbor; Department of the Lakes, headquarters, Chicago; Department of the Gulf, headquarters, Atlanta, Ga.; Department of Dakota, headquarters, St. Paul; Department of the Missouri, headquarters, Omaha; Department of the Colorado, headquarters, Denver; Department of the Columbia, headquarters, Vancouver's Barracks, Washington; Department of California, headquarters, San Francisco. The Hawaiian Islands are included in the Department of California; the Island of Porto Rico constitutes the Department of Porto Rico, headquarters, San Juan. The Philippine Islands constitute the Department of the Pacific, with headquarters at Manila. In addition to the regular army, nearly every state and territory has a militia, organized and governed in each state by special statute laws. On Jan. 1, 1898, the total organized militia in the United States comprised 9196 officers and 105,166 men.

The army consists of two branches, the *line* and the *staff*. The former includes officers and men doing field or garrison duty; the latter is a board, composed of experienced officers, whose duty it is to keep the line supplied with all things necessary for the successful prosecution of its work. The various departments, such as those of the quartermaster and inspector, were formerly separated by a bill approved Feb. 14, 1903, these departments were abolished, also the office of commanding general; in the latter's place is a chief of staff, who has complete direction of all movements and departments of the army, insuring at least system and coöperation among the various branches of administration. General Miles, first chief under the act,was retired Aug. 8, 1903. As the chief of staff is retired the next officer in rank is expected to succeed him, though this order may be set aside. All officers of the staff must return after five years to the line, where they must serve at least two years. Closer relations have also been established by this act between the national guard and the military department. The United States has always been reluctant to demand that her citizens should spend the best years of their lives in the army, and the immense cost of keeping a standing army in time of peace has made this country favor a small army with a large militia force, doubtless, however, to the disadvantage of a strict military system. See MILITIA; MILITARY ACADEMY, UNITED STATES; PENSION, and numerous other articles relating to the organization of the army.

British Army. In England the Bill of Rights of 1689 forbade the king to maintain a standing army without the consent of Parliament, and it is still the custom of that body to authorize, from time to time, the present standing force. In 1874 the military system was carefully reorganized, only those things being retained which had been proved of most value; but during the stubborn contests with the Boers, defects were found in the organization. So, in 1904, plans were laid for a complete change which should throw the army into harmony with the navy. Under this plan a small but efficient army is maintained for the colonies, and a powerful, trained militia is established for home defense. The ranks of the army are to be filled by voluntary enlistment and without recourse to conscription, in this respect being entirely different from the Continental armies. A committee on imperial defense has charge of the land and sea forces to such an extent as to secure unity of action. The administrative duties are separated from those of the actual command of the troops in the field, and opportunities are given for trained and ambitious officers to rise in the service and take the places of those who intend the army as a mere stepping stone to some better paid profession Regulars in the general service now spend 9 years on active duty, followed by 3 in reserve. Home service regulars, who are sent abroad only in emergencies, enlist for 2 years and spend 6 in the reserve. Difficulty has been found in securing enough volunteers to keep the enrollment at the figure required. In October, 1903, the army numbered about 751,000 men, of whom 361,000 were regulars; 66,000 reserves, liable for a fortnight's drill annually; 106,000 militiamen of various kinds, and 282,000 volunteers. Among the latter were included the imperial yeomanry, which rendered distinguished service against the Boers. The militia, which enrolls for 6 years, is liable for one or two months' drill each year. Of the regulars, about 185,000 are infantry; over 55,000 are artillery; 24,000 are cavalry and about 27,000 are noncombatants. A command or army corps contains 3 divisions of 6 brigades of infantry, with a proportional supply of other troops. A battalion on foreign service consists of 1011 officers and men. Two such battalions are assigned to a regiment, and 2 regiments constitute a brigade in infantry. All regiments except the cavalry have certain districts which they regard as their home station. In India the army has a war strength of 324,000 men, of whom about 75,000 are British regulars, mainly cavalry and artillery; 154,000 are Indian regulars, and many are irregulars in the service of Indian princes, but drilled by English officers. Canada holds all her citizens between 18 and 60 years of age liable for military service, and has a standing militia of about 42,000. Recently, provision has been made for 100,000 militia, half of which is an untrained reserve. Other British colonies maintain small forces, often under the direction of British officers; and during the Boer War, several of these sent contingents that proved valuable aids to the home government.

German Army. By the constitution of 1871, the Prussian obligation to serve in the army is extended to the whole Empire. Every German capable of bearing arms must serve in the army or navy for 12 years—7 in the standing army (3 with the colors, and 4 in the reserve), and 5 in the *landwehr;* or corresponding periods in the fleet and *seewehr*. Afterward he is enrolled in the *landsturm* until 42 years of age. In the infantry, however, many of the more intelligent men are subjected to only 2 years' training; and "one-year volunteers" are passed into the reserve at the end of their first year, on condition of passing certain examinations and bearing the expense of their clothing and equipment for the year. In the German organization the territorial system is carried out thoroughly. The army consists of 18 army corps, 13 of which are Prussian; each of these is raised, recruited and stationed within a particular district. These corps districts are divided into divisional and brigade districts, which are subdivided into *landwehr* battalion districts, and these in turn into company districts, so that every unit in the army has its definite place. Each line regiment (3 battalions) draws its recruits from an allotted district, and passes its time-expired men into the *landwehr* regiment (2 battalions) of the same district. After the exemptions common to all countries have been granted, the ballot allows a margin of about 10 per cent; those who draw the fortunate numbers passing at once into the Ersatz reserve, which receive no training, but may be called upon to replace casualties in the field.

French Army. A law passed in 1872 enacted that every Frenchman, with a few exceptions, unless serving in the navy, was liable to personal service in the army, and forbade substitution. The period of liability extended to 20 years, of which 5 were spent in the active army, 4 in the reserve of the active army, 5 in the territorial army, and 6 in the reserve of the territorial army. The expense of keeping up such an establishment in peace, however, led to the division of the recruits by ballot into two classes, one of which served the full 5 years in the active army, while the other was sent home after 6 months' or a year's training. One-year volunteers were also accepted; but so many men joined in that capacity, that, in 1887, a bill was brought before the French legislature abolishing the privilege. In the same year an Army Reorganization Bill was introduced, reducing the period of service with the colors to 3 years, and proposing a large addition to the establishment. The object of the changes was to add materially to the number of efficients without increasing the military budget. In 1904 there were about 550,000 men actually in service and about 25,000 in the police department. The war footing of the entire army is estimated at 3,500,000 trained soldiers. From time to time great reviews are held, which result in better discipline and organization and in a marked increase in the enlistment. French troops, though they are rather small in stature, are capable of great activity and endurance, and are noted for the impetuosity of their attack.

Austro-Hungarian Army. The forces of the empire are divided into the standing army and the *landwehr* and *landsturm*, as in Germany. All subjects are liable to service, and those exempted on physicial grounds pay a fine proportionate to their means. In principle, every qualified man must serve 3 years with the colors, 4 in the reserve, 5 in the *landwehr*, and, by a law passed in 1886, 12 in the *landsturm*, from which, in time of war, men may be drafted into the *landwehr*. Men who have passed through the regular army will be liable for service in the *landsturm* as officers or non-commissioned officers till the age of sixty. In practice, however, financial considerations cause the division of recruits into three classes: about 95,000 annually form the first class, trained as above; nearly 10,000 are drawn to supply the Ersatz reserve and all the remainder are passed at once into the *landwehr*, there to serve their 12 years. The regiments of the standing army are under the control of the minister of war of the Empire, while the *landwehr* is controlled by the Austrian and Hungarian ministers of national defense. There is no permanent corps organization, the division being the principal unit; but in war, 3 infantry divisions, with a proportion of cavalry and a regiment of artillery, would be joined to form a corps. On a peace footing there are 346,000 men, and in war time, by including the militia, about 3,000,000 troops could be raised. The general discipline is excellent and the officers receive technical training of a very high order. The cavalry is said to be the best in Europe.

Russian Army. Since 1874 the Russian government has required military service from all men between the ages of 21 and 43 years. But though over 1,000,000 men annually become of age, only about 300,000 are enrolled in the standing army. So vast is the population of Russia, however, that though she supports the largest standing army in the world, yet the burden has not been regarded as heavy. Her military system is practically that of Germany. It is very difficult to make an accurate estimate of the size of the Russian army, because of the changes due to the recent Japanese War and the secrecy always maintained as to the movements of the forces. It is thought certain, however, that in peace strength it is considerably over 1,000,000 men, and that in war strength fully 5,500,000 trained men might be thrown into active warfare. Of the peace army about 710,000 are infantry; 130,000, including the Cossacks, are cavalry; 153,000 are artillery, and the remainder, engineers and other auxiliaries. The soldiers of Russia, excepting the royal guards, are rather below the average, both in physique and general intelligence.

Italian Army. The Sardinian law of conscription forms the basis of the Italian system, and all are liable from eighteen to forty. Substitution is allowed in the case of brothers, and one-year volunteers are accepted. The soldiers are divided by lot into two classes, one enjoying unlimited furlough, and the other serving 8 years in the army, 4 in the active militia, and the rest of their time in the local militia. In infantry regiments 3, in cavalry regiments 5 years only, are served with the colors; the remainder, as a rule, being spent on furlough. The kingdom is divided into five "zones," and, in direct opposition to the Prussian principle, recruits are drawn from all zones for each regiment.

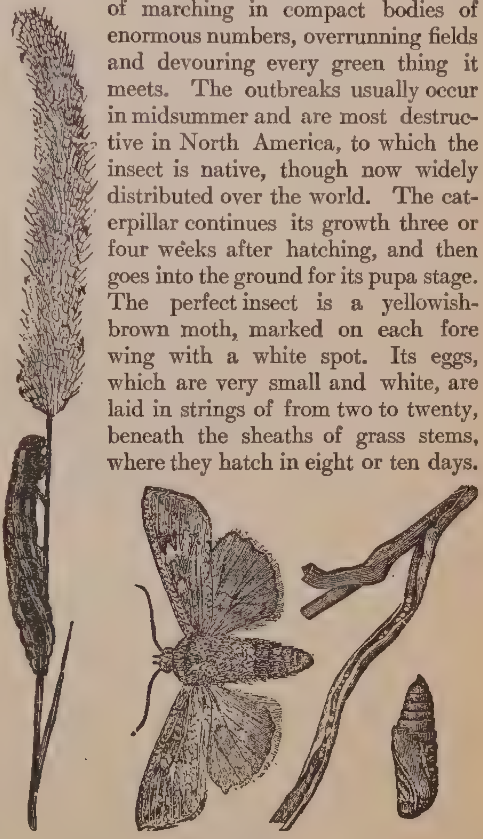
Other European Nations. Of the other military powers of Europe, the army of Belgium, including the staff and all arms, rank and file, numbers about 50,000 men, besides the Garde Civique, 40,000; Denmark, 50,000, including the extra reserve of 14,000; Netherlands, 6000 in Europe, and 31,000 in the East Indies; Spain, 145,000, with 40,000 in the colonies; Sweden, 40,000, besides the conscription troops, 135,000, and the militia, 16,000; in Norway, the troops of the line are about 12,000 in peace, and in time of war not more than 18,000 without the consent of the Storthing; Switzerland, 117,000, and the *landwehr,* 4.000; the army of Turkey can be raised by mobilization to 475,000.

Japanese Army. The Japanese army has come into being in the last century and was organized by German officers. At present it is remarkably efficient, and possibly one of the best organized and managed forces in the world. From the age of 17 to 40 every male must give military service, 3 years in the active army and 4⅓ in the reserve; 10 years in the territorial army and the remainder in the home guard militia. On war footing the active army numbers about 245,000 men, and the territorial army about 121,000. Reserves and militia have been levied in large numbers, and it is probable that there are many more than 500,000 fully trained soldiers in the Empire. The Mikado is chief in command, and rules through a general staff. The noncombatant corps, such as the hospital, engineer, transport and supply corps, in the recent war with Russia showed remarkable efficiency.

Chinese Army. Until recently it may be said that the Chinese had no well disciplined or well equipped army; though, as the Chinese are strong, fearless and possessed of great power of endurance, there is no reason why they should not have a powerful and efficient army. In fact, at the present time there is a general awakening on this subject, and Chinese officers are being educated to organize and drill an army after modern methods.

Army Organization, a term used to describe all those arrangements which tend to increase the strength and efficiency of an army. Unless every soldier knows his duty and obeys his superior implicitly, confusion will result. On the other hand, every soldier must be provided with supplies and must be protected in his rights. The work required of an army determines its size and organization (See ARMY). In every branch the unit is the largest body which one man can efficiently command. Above this unit of private soldiers all command is through officers or subordinates, but in the beginning it originates from a commander in chief (See RANK). In the United States the army corps is the smallest complete unit in which all the branches of the army are brought together. An army corps of this character consists of 3 divisions of more than 10 regiments of artillery and infantry each, together with at least 1 regiment of cavalry. An army corps is so stationed that it can be concentrated on any one part of itself within a day. Under ordinary conditions the proportion of men is about 12 infantrymen to 1 cavalryman and about 4 cannon to every thousand men. Of course, in a campaign this proportion may vary decidedly, according to the nature of the work required. A wagon train for the transportation of provisions is a necessary adjunct to an army, and at the beginning of the Civil War about 49 wagons were required for every thousand men, but later experience proved that less than 25 were really necessary.

Army Worm, a striped caterpillar about an inch and a quarter long, so called from its habit of marching in compact bodies of enormous numbers, overrunning fields and devouring every green thing it meets. The outbreaks usually occur in midsummer and are most destructive in North America, to which the insect is native, though now widely distributed over the world. The caterpillar continues its growth three or four weeks after hatching, and then goes into the ground for its pupa stage. The perfect insect is a yellowish-brown moth, marked on each fore wing with a white spot. Its eggs, which are very small and white, are laid in strings of from two to twenty, beneath the sheaths of grass stems, where they hatch in eight or ten days.



ARMY WORM
Worm, pupa, moth and eggs.

Arndt, *ahrnt,* ERNST MORITZ (1769–1860), a German patriot and poet. He was appointed professor of history at Greifswald in 1806, and in the next year he stirred up the national feeling against Napoleon in his *Spirit of the Times.* In 1812–1813, while helping Baron von Stein in Russia to organize the opposition to Napoleon, he zealously promoted the war of independence by a number of pamphlets, poems and spirited songs, among which it is sufficient to refer to *What is the German's Fatherland?* and *Song of the Field Marshal.* These were caught up and sung from one end of Germany to the other.

Arn′hem, a town in Holland, in the province of Gelderland, on the right bank of the Rhine, 35 mi. s. e. of Utrecht. It manufactures cabinet wares, mirrors, carriages and mathematical instruments, and the trade is chiefly in grain and tobacco. In 1795 it was stormed by the French, who were driven from it by the Prussians in 1813. Population in 1900, 56,812.

Ar′nica, a genus of plants, consisting of some twelve species, one of which is found in Central Europe and in the Western states of the Union. It has a perennial root, a stem about two feet high, bearing on the summit heads of a dark golden yellow. In every part of the plant there is an acrid resin and a volatile oil, and in the flowers an acrid bitter principle called *arnicin.* The root contains also a considerable quantity of tannin. A tincture of arnica is employed as an external application to wounds and bruises, as it drives away the blood that collects around the injury.

ARNICA

Arnim, *ahr′nim,* Elizabeth or Bettina von (1785–1859), a German author, a sister of Clemens Brentano. She is known chiefly for her *Correspondence of Goethe with a Child,* which she also translated into English. These letters, while most graphic and fresh, are for the most part fictitious, although she did in her youth have a correspondence with Goethe, whom she passionately admired.

Ar′no, one of the largest rivers of Italy, rising in the Etruscan Apennines, at an elevation of 4430 feet above the sea. It flows at first south, then trends westward, divides Florence into two parts, washes Pisa and falls four miles below it into the Tuscan Sea. Its length with its windings is about 150 miles. The river is navigable from the sea to Florence. The famous valley, Val d'Arno, is one of the richest and most beautiful in Italy.

Ar′nold, Benedict (1741–1801), an American general, born in Norwich, Conn. He received a common school education, went to New Haven and there conducted a book and drug store. At the outbreak of the Revolution he entered the army, and after the Battle of Lexington he was sent to lead an expedition for the capture of Crown Point and Ticonderoga. On his way thither he met Ethan Allen with a company of soldiers devoted to the same purpose. Allen took the lead and captured Ticonderoga, and four days later Arnold captured Saint John's. In the autumn of the same year Washington dispatched Arnold with one thousand men to assist in capturing Quebec, and after his juncture with General Montgomery a combined attack was made. The American army was defeated, Montgomery was killed, and Arnold's leg was fractured. Congress promoted him to the rank of brigadier general for his bravery in this campaign. In 1776 he fought a naval battle on Lake Champlain, during which he ran his own vessel ashore, burnt her, and with his other ships retreated to Ticonderoga.

In 1777 Congress appointed five major generals for the army, all of whom were Arnold's juniors. He was stung by this injustice, and Washington wrote to assure him that he would endeavor to remedy "the error;" but when his claims were presented Congress voted him thanks, but did not promote him. In the same year Washington urged Congress to send Arnold north to head off General Burgoyne. Arnold consented to serve, and he fulfilled his part in the campaign faithfully. He joined General Schuyler and led an expedition to relieve Fort Stanwix, which was besieged by a force of British and indians, and he then returned to the main army and took part in the first Battle of Bemis Heights (See Saratoga, Battles of). Soon afterward Congress sent him his commission as major general.

In 1778 he was appointed to the command of Philadelphia. He became involved in quarrels with the authorities of Pennsylvania and was tried by court-martial, but was acquitted of intentional wrong-doing, though in some respects his conduct was declared improper. The sentence was that he should receive a reprimand from the commander in chief. Washington discharged this duty with considerable reluctance, and assured Arnold of his continued esteem and of the high estimate he placed on his services. Arnold's first wife had died, and he married Miss Margaret Shippen, a daughter of Chief Justice Shippen of Pennsylvania. Through this marriage he was brought into connection with several Tory families, and a correspondence was opened with Sir Henry Clinton. In 1780 he was given the command at West Point, and he began at once to plan to surrender it to Clinton. His treachery became manifest through the capture of Major André and Arnold escaped to New York City. He was compensated with a British brigadier general's commission and a sum of money, but he was despised and shunned even by the British, and died in obscurity.

Arnold, Edwin, Sir (1832–1904), a British poet, scholar and journalist. In 1861 he joined the editorial staff of the *Daily Telegraph*, with which he was connected for many years. He was the author of poems, narrative and lyrical; of numerous translations from the Greek and Sanskrit; of *The Light of Asia*, a poem presenting the life and teaching of Gautama, the founder of Buddhism; of *Pearls of the Faith*, *The Voyage of Ithobal*, *East and West*, and various other works.

Arnold, Matthew (1822–1888), an English critic, essayist and poet, a son of Dr. Thomas Arnold of Rugby. He was for many years a British school inspector and was for a time professor of poetry at Oxford. As both poet and critic, Arnold was highly esteemed in his own day, and his reputation has grown steadily, so that while he does not appeal to as wide an audience as Tennyson or Browning, he may almost be ranked with them as one of the great poets of his age. Besides *Sohrab and Rustum*, his most popular poem, *Balder Dead* and *Tristram and Iseult*, he wrote many beautiful shorter poems, among which are *The Forsaken Merman*, *Dover Beach*, *Faded Leaves*, *A Summer Night* and *The Youth of Man*. His *Thyrsis* stands with *Lycidas* and *Adonais* as one of the finest elegies in English. The bulk of his poetry is relatively small. As a critic Arnold has no superior in English literature, and his influence on criticism is still great. His best-known critical essays are contained in the two series of *Essays in Criticism*. Among his other prose writings are *Culture and Anarchy*, *On Translating Homer* and *Literature and Dogma*.

Arnold, Thomas (1795–1842), a celebrated English scholar, clergyman and teacher, born at Cowes, Isle of Wight. While a student at Oxford, he became known for the boldness and independence of his views and his excellent scholarship. Arnold's life work began when he was elected head master of Rugby School, which position he held until his death. During his administration he completely revolutionized the methods of instruction and discipline and made such a strong impression upon other schools of England that many of them adopted his plan, and he is considered to have been the means of completely changing the system of education in the English public schools. Arnold accomplished his work not so much by his direct methods of teaching as through his influence upon the pupils and the ideals which he set before them. His main purpose was the development of character, and this he secured through his strong persaonlity, thorough trust in his pupils and the blameless life which he led. Consult Fitch's *Thomas and Matthew Arnold, and Their Influence on English Education;* also *Tom Brown's School Days*.

Ar'pad (?–907), a hero of Hungarian ballad and romance, and the real founder of the kingdom of Hungary. The Arpad dynasty reigned till 1301.

Ar'quebus, an early form of firearm resembling a musket. It was fired from a forked rest, was sometimes cocked by a wheel and carried a ball that weighed nearly two ounces. A larger kind, used in fortresses, carried a heavier shot.

Ar'rah, a town of British India, in Shahabad district, Bengal, rendered famous during the mutiny of 1857 by the heroic resistance of a body of twenty civilians and fifty Sikhs to a force of 3000 sepoys, who were ultimately routed and overthrown by the arrival of a small European reinforcement. Population, about 50,000.

Ar'ran, a small mountainous island of Scotland, in the Firth of Clyde, noted among geologists because of its remarkable formation, and among botanists because of the variety and rarity of its plants. Population, about 5000.

Arras, *ahr'ras*, a town of France, capital of the department of Pas-de-Calais, 30 mi. n. e. of Amiens and 100 mi. n. n. e. of Paris. Arras has several handsome squares and a citadel, cathedral, public library, botanic garden, museum and numerous flourishing industries. In the Middle Ages it was famous for the manufacture of tapestry, to which the English applied the name of the town itself. The grain market here is a very important one in northern France. Population in 1901, 20,697.

Arrest'. See Procedure.

Ar′row, a pointed shaft now thought of chiefly in its connection with the bow, as used in archery. It is one of the earliest of savage implements and was at first identical with the spear and javelin, but later was thrown by a sling or crossbow. See Bow.

Ar′rowroot′, an edible starch obtained from the root-stocks of several different species of plants. It is not known exactly how the name originated, but it may be due to the fact that the scales on the roots of some plants are shaped like an arrowhead. Large quantities of arrowroot are imported every year into the United States and Europe. It is a delicate starch and is used as a food, especially for invalids and infants. The arrowroot of the stores is very apt to have been adulterated with rice-starch or even the starch of common white flour.

ARROWROOT

Arru, *a roo′*, **Islands,** a group of islands south of western New Guinea. The largest, Tanah Bessar, is 80 miles long and 45 miles wide. These islands are composed of coralline limestone. They nowhere exceed 200 feet above the sea and they are well wooded and tolerably fertile. The chief exports are trepang, tortoise-shell, pearls, mother-of-pearl and edible birds'-nests. Dobo is the chief commercial center. Population, about 15,000.

Ar′senal, an establishment where guns, arms or other munitions of war are repaired and stored. Those which deal with the ships and their armament are called *naval arsenals,* or, in the United States and England, *navy yards.* Naval arsenals in the United States are merely storehouses for army explosives generally. Explosives are usually manufactured at places removed from the general arsenals and out of the way of the public. In 1777 at Springfield, Mass., was established the first arsenal, and since 1787 the manufacture of small arms has been continued at this place. Harper's Ferry arsenal was built in 1795. In 1901 there were in the United States seventeen other arsenals, armories or ordnance depots.

Ar′senic, a metallic element of very common occurrence, found in combination with many of the metals in a variety of minerals. It is of a dark-gray color and readily tarnishes on exposure to the air, changing first to yellow and finally to black. In hardness it equals copper; it is extremely brittle and evaporates quickly, beginning to waste away before it melts. It burns with a blue flame, and emits a smell of garlic. It forms alloys with most of the metals. Combined with oxygen, arsenic forms two compounds, the more important of which is the *white arsenic*, or simply *arsenic* of the shops. It is usually seen in white, glassy, translucent masses, and is obtained by sublimation from several ores containing arsenic in combination with metals, particularly from arsenical pyrites. Of all substances arsenic is that which has most frequently occasioned death by poisoning, both by accident and design (See ANTIDOTE). Like many other virulent poisons, it is a safe and useful medicine, especially in skin diseases, when judiciously employed. It is used as a flux for glass, and also for forming pigments. The arsenite of copper and a double arsenite and acetate of copper (emerald green) are largely used by painters; they are also used to color paper-hangings for rooms, a practice not unaccompanied with considerable danger, especially if flock-papers are used or if the room is not well ventilated. Arsenic has been too frequently used to give the bright green often seen in colored confectionery, and to produce a green dye for articles of dress and artificial flowers.

Arsin′oë (called now, Medinet el-Fayum), a city of ancient Egypt on Lake Moeris, said to have been founded about 2300 B. C. It was renamed after Arsinoë, wife and sister of Ptolemy II of Egypt, and was called also Crocodilopolis, from the sacred crocodiles kept there.

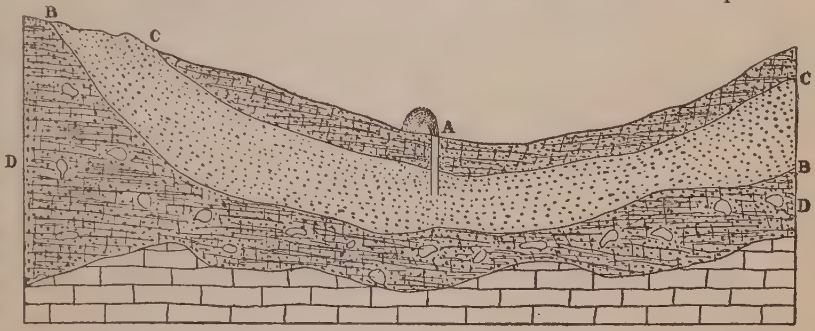
Ar′son, in common law, the malicious burning of a dwelling-house or outhouse of another man; also, the willful setting fire to any church, warehouse, mill, barn, agricultural produce, ship, coal-mine and the like. By the common law it is a crime, and if homicide result, it is murder. In the United States and Great Britain the punishment is increased if the burning is to defraud insurers. See Crime.

Artaxerxes, *ahr'taks urks'eez,* the name of several Persian kings, most important of whom was Artaxerxes, surnamed *Mnemon,* who succeeded his father, Darius II, in 404 B. C. After having vanquished his brother Cyrus in the Battle of Cunaxa, he made war on the Spartans, who had assisted Cyrus, and forced them to abandon the Greek cities and islands of Asia to the Persians.

Ar'temis. See Diana.

Artemisium, *ahr'te mish'e um,* a promontory in Euboea, an island of the Aegean, near which a naval battle between the Greeks and Persians was fought in 480 B. C.

Ar'teries, the system of vessels or tubes which convey the blood from the heart to all parts of the body. As they proceed from the heart, they divide and subdivide, diminishing in size, and finally terminating in minute capillaries that unite the ends of the arteries with the beginnings of the veins. The arteries are made up of three coats: an outer elastic one which is readily distended; a middle or muscular one which by its contraction helps to force the blood onward; an inner one, smooth, in order that the blood may move easily. The coats gradually disappear as the arteries decrease in size; when the muscular coat has gone, the artery has became a capillary with but one thin coat. The life of any part of the body being dependent on the supply of arterial blood, the tiny arteries anastomose, or join with one another in the form of a network, so that if the supply is cut off from one it may go through another. The blood flowing from a wounded artery is bright red in color and comes out in spurts in an uneven stream. To check the flow, press on the artery between the wound and the heart. Cording the limb is effective. See Circulation; Veins; Wounds.



Artesian, *ahr te'zhan,* **Well,** a well formed by boring or drilling to a considerable depth. These wells were named from the province of Artois in France, where they appear to have been first used on an extensive scale. At first the name was restricted to flowing wells, but now it is applied to all wells formed by boring. In the cut, *B* represents a layer of porous sand and gravel between two impervious layers, *C* and *D*. If a well is sunk through *C*, the water will rise in it and flow at *A*, because the highest point of *B* is above the level of *C* at the point where the well is bored. When the land is nearly level the well will not flow and pumping must be resorted to. The layer *B* is supplied with water from rain which falls upon it where it appears at the surface. This perlocates down through the sand and gravel until the entire layer is saturated. If the area covered by this layer is large, the volume of water thus stored is very great, and many wells may be bored in the region which it underlies.

The water in most artesian wells is pure and suitable for domestic purposes and for stock, though it occasionally contains minerals. Artesian wells are very common in all regions where surface water of good quality is not easily obtained. In the southwestern part of the United States, as well as in some other parts of the world, they are also used for obtaining water for irrigation. For the method of sinking artesian wells, see Well Boring.

Artevelde, *ahr'te vel'de,* Jacob van (about 1290–1345), a brewer of Ghent, selected by his fellow townsmen to lead them in their struggles against Count Louis of Flanders. In 1338 he was appointed captain of the forces of Ghent, and for several years exercised a sort of sovereign power. A proposal to make the Black Prince, son of Edward III of England, governor of Flanders, led to an insurrection, in which Artevelde lost his life.

Artevelde, Philip van (1340–1382), son of Jacob van Artevelde, was placed by the Flemings at the head of their revolt against the count of Flanders. He gained a great victory and for a time assumed the state of a sovereign prince; but in 1382 he fell, with thousands of the Flemings, at Rooseboeke in a battle against a French army sent by Charles VI.

Arthrop'oda or **Articulata,** the sixth family of the animal kingdom, so named because the bodies of its members are in joints or segments. Each segment, in typical form, carries two appendages which are jointed and which perform special functions. Some are suckers; some are used in swimming, and others are jaws, organs of sense or savage, defensive weapons. There is an organ which resembles a heart, but the blood returns to it through the tissues of the body and not through the veins. The Arthropoda possess a well-organized nervous system, and usually have either simple or compound eyes. Many species of Arthropoda are parasitic in their life, and in this case they lose the use of many of their organs, some of which disappear entirely. The Arthropoda compose a large and important branch, chief among them the insects, the spiders and the crustaceans. The reader should consult the articles CRUSTACEA, ARACHNIDA, MYRIAPODA; INSECTS, and the numerous articles therein referred to.

Ar'thur, CHESTER ALAN (1830–1886), an American statesman, twenty-first president of the United States, born at Fairfield, Vt., of Scotch-Irish parents, his father being pastor of Baptist churches in Vermont and New York. He graduated from Union College in 1848, studied law and practiced successfully in New York, becoming conspicuous as counsel in the famous Lennon case, which resulted in giving negroes equal rights with whites in New York City street cars. During the Civil War he was commendably energetic, as quartermaster general of New York, in the raising and equipping of troops.

For his activity in Republican politics, he was afterward made collector of customs for the port of New York, and was reappointed in 1875. He thereafter identified himself with the Conkling or "Stalwart" faction in the State of New York, and with the Conkling-Grant wing of the party in their 1880 campaign (See CONKLING, ROSCOE). In that year, as a concession to this faction, which was defeated, he was nominated for vice-president, and upon the death of President Garfield in 1881 became president. His somewhat questionable activity in partisan politics, which had continued during his term as vice-president, suddenly ceased, and his administration was creditable to his honesty and fearlessness. The chief events were the appointment and report of a tariff commission, action against polygamy and Chinese immigration and in favor of an increased navy and civil service reform. He was a candidate for the presidential nomination in 1884, but was defeated by James G. Blaine and died in New York City two years later.

CHESTER ALAN ARTHUR

Arthur, KING, a hero said to have reigned as king of the Britons in the sixth century. He married Guinevere, and established the famous Round Table at his court at Caerleon-on-Usk. On all sides the invaders of his country were defeated, the land was reduced to order and his knights rode abroad redressing wrongs. Despite his example and precepts, some of his knights remained evil and treacherous, and while he was absent on an expedition to Rome, Modred, his nephew, stirred up a rebellion. In his contest with the rebellious knights on his return, Arthur was mortally wounded. He was carried away to the island of Avalon to be healed, and for a long time the Britons in the generations which followed him believed that he would return and reëstablish his righteous rule. This story of Arthur is supposed to have some foundation in fact. It has been used as a basis for many poems, notably Tennyson's *Idylls of the King*.

Arthur, TIMOTHY SHAY (1809–1885), American story-writer. He wrote many popular domestic tales, and founded *Arthur's Home Magazine.* Best-known of his writings was *Ten Nights in a Bar-room.*

Arthur's Seat, a picturesque hill near Edinburgh, Scotland. It is 822 feet high and is composed of a number of different kinds of rocks. It derives its name from the legendary King Arthur.

Ar'tichoke, a well-known plant somewhat resembling the thistle, with large, divided, prickly leaves. The erect flower-stem terminates in a large, round head of numerous imbricated oval, spiny scales, which surround the flowers. The fleshy bases of the scales, with the large receptacle, are the parts that are eaten. The Jerusalem artichoke is a species of sunflower, whose roots are used like potatoes.

ARTICHOKE

Article, in grammar, a name given to two words used as limiting adjectives. They are the definite article, *the,* and the indefinite article, *a* or *an.* See ADJECTIVE.

Articles, THE THIRTY-NINE, of the Church of England; a statement of the particular points of doctrine, thirty-nine in number, maintained by the English Church. They were first promulgated by a convocation held in London in 1562–1563 and were confirmed by royal authority. The original articles, forty-two in number, were drawn up by a commission of eight bishops, eight divines, eight civilians and eight lawyers appointed in 1551, Ridley, Cranmer and Coverdale being among the number, and were issued in the reign of Edward VI. Queen Mary would not acknowledge them, but, under Elizabeth, Archbishop Parker revised them, reducing them to thirty-nine. They were ratified anew in 1604 and 1628. They are a formula, not a creed, of the Church. By the Clerical Subscription Act of 1866, the clergy do not have to subscribe to these articles, but declare an assent to them and the Prayer Book. Since 1871 members of Oxford and Cambridge Universities are not obliged to sign them. This formula is now accepted by the Episcopalian churches of Scotland, Ireland and America.

Articles of Confederation. See CONFEDERATION, ARTICLES OF.

Artic'ula'ta, the third of the great divisions of the animal kingdom, according to the arrangement of Cuvier, including all the invertebrates whose external skeletons are in the form of a series of rings, united at joints and covering the body. The name is going out of use now. See ARTHROPODA.

Artificial, *ahr ti fish'al,* **Limbs.** Accident and disease have resulted in loss of limbs since the earliest times, and rude substitutes for them were early designed. Buried with a skeleton in a tomb dating before the Christian era was a rude leg of bronze and wood. But it was not until the nineteenth century that substitutes were made so successfully as partially to conceal the wearer's loss. Now, especially in the United States, there are hundreds of very ingenious patents covering a great variety of artificial substitutes. During the Civil War in the United States so many limbs were lost that the government passed a law giving artificial limbs to crippled soldiers and sailors of the war, and once every five years the limbs are renewed.

Limbs are made principally of the fine, close-grained wood of the English weeping willow, though recently aluminum is used to a considerable extent because of its lightness and strength. If the limb is to be made of wood, the piece is first turned in the lathe to the general shape of a leg or arm and then hollowed out until the shell is from one-fourth to five-eighths of an inch thick. It is then whittled down to the general shape required, when the proper angles and depression in the top of the inside portion are cut so that it will exactly fit the stump for which it is intended. Upon the accuracy of this fit depends the comfort which the wearer will take with the limb. The foot is whittled out entirely by hand, and is fastened to the leg by means of a hinge; the more expensive pieces have another hinge fitted up for the toes. When the amputation is above the knee, another hinge is prepared for the knee-joint, so that the leg will swing readily in walking. After the wooden pieces have been completed and polished, a fine piece of rawhide is shrunk over them and fastened by means of glue. As the skin dries it shrinks and adds much strength, but does not increase the weight materially. The bottom of the foot is made of soft rubber, for the purpose of giving a natural spring in walking. Limbs are attached usually by means of leather bands which may be laced tight, or are held up by straps running over the shoulders like suspenders. Arms are often so fitted that the hand may be unscrewed, and a knife or fork or hair brush, made especially for the purpose, put in its place. Deformed feet are often pieced out with blocks of wood whittled to the proper shape.

Artificial substitutes are also made for other members of the body. A nose, for instance, is first molded into proper shape from papier-maché. It is then tinted, waxed and varnished to match the complexion of the noseless person, and is fastened on by means of a pair of spectacles or by clamping it to the remaining stump. Ears are made in the same way, but they are more difficult to attach. In making artificial eyes, the first step is to blow a bulb from molten glass; then one side is broken out, the edges of the remaining shell are blunted, and the shell itself is worked into the proper size and shape, which have been determined previously by measurement. By very deicate and skillful handling, pieces of colored glass are worked in by heat until a perfect imitation of the person's remaining eye is secured. The coloring of the iris is the most difficult step in the process.

Artil'lery, the name given to the land troops who use large guns which require to be fastened upon platforms and cannot be fired by hand. In this sense artillery is a third branch of the army, whether in the field or at fixed posts (See INFANTRY; CAVALRY). The word artillery is also applied to the great guns themselves—cannon, mortars, howitzers and, in fact, all that are fired from fixed rests, together with all the apparatus and stores that go with the great guns (See CANNON). Field artillery is the most expensive branch of the modern army, and it is considered of great importance. Such artillery must be light enough to be handled rapidly when drawn by six horses, and at the same time must have sufficient weight and strength to give rapid, accurate and destructive fire, as it must accompany the army. Such artillery must be able to conceal itself in detached positions, to prepare the way for an infantry charge, to follow the charge rapidly and support it, or to cover a retreat and then be able to draw away without being captured. The howitzer, for dislodging an intrenched foe, and a gun capable of rapid horizontal fire to destroy the troops after their intrenchments have been cut down, are considered necessary. Of the latter class, the French at present seem to have the most effective gun, a rifle cannon, capable of firing twenty rounds a minute and operated by two men under the protection of a steel shield. In the United States a similar arm has been independently invented. It has a three-inch caliber, fires a shot accurately a distance of 6000 yards and has a total range of 7500 yards. Twenty shots a minute can be fired without disturbing the aim, though so great is the strain upon the gun and the gunners that this cannot be continued for a great length of time. In some armies light guns, known as *horse artillery*, are taken with the cavalry to open the way for their charges and protect them during retreat. In the horse artillery the gunners themselves are mounted. *Siege artillery* consists of heavy guns which are mounted on carriages and are moved with considerable difficulty. The five-inch siege gun weighs 3660 pounds and is over 12 feet long. It fires a shot that weighs 45 pounds, and at a distance of two miles will pierce 2½ inches of steel. *Coast* and *fortress artillery* is mounted on fixed carriages and has no motion except that which is necessary for firing from the embrasures and for the lowering of the gun so that it may be loaded while the gunners are under protection (See GUN CARRIAGE). The most powerful gun ever constructed, and one of the largest, is a sixteen-inch breech-loading steel rifle mounted at New York harbor. It is over 49 feet long, weighs 130 tons, fires a projectile 5½ feet long, weighing 2400 pounds, a distance of 21 miles. During its flight the shot reaches a height of 6 miles. At the time the shot leaves the gun it is fired with a force sufficient to penetrate 42.3 inches of steel. Such a gun, however, is not considered by military experts to be as valuable as a lighter one, because it is slow in firing and difficult to handle. Eight, ten and twelve-inch rifles are those in most common use in the United States. Naval guns are used in all sizes and have the same general characteristics possessed by other artillery, but are made as light as possible. The modern battleship requires a great variety of guns for her various duties. The *Connecticut*, which is one of the most powerful of the world's ships, carries 4 twelve-inch rifles, 8 eight-inch rifles and 12 seven-inch rifles. It has, in the upper works, a secondary battery useful in clearing the fighting-tops of an opposing ship, besides 12 three-inch rapid fire guns, 12 three-pounders, and 14 machine guns. The *Connecticut* seven-inch rifles fire a 165-pound shell with a velocity of 2900 feet per second. See ARMY; ARMOR PLATE; TACTICS.

Arts. Art is the use of knowledge to accomplish results, or the rules by which these results are accomplished. In a broad sense the term art refers to anything which is not an immediate product of nature, but is artificial and done by the aid of human skill. The term is commonly used to designate skill in performing some special kind of work, either mental or physical. The arts may be classified into *useful* or *mechanical* arts, those which are intended to produce material results, and *fine* arts, those which are intended to give pleasure. The mechanical or industrial arts may be practiced by any one who has acquired skill, but the fine arts may be successfully practiced only by those who have real genius or talent, as well as skill. Such studies as philosophy, science and history are called liberal arts. See FINE ARTS; ARCHITECTURE; PAINTING; SCULPTURE; MUSIC.

A'rum, a genus of plants more commonly known as calla, closely related to the Jack-in-the-pulpit and the skunk cabbage. The flowers are small and inconspicuous, being closely massed in a short spike, or spadix, enclosed and overhung by a vari-colored leaf, or spathe. Many varieties are cultivated in hot-houses on account of the beauty of their spathes. The stems and leaves contain a bitter juice, and the bulbs from which the plants spring have a starch which may be used for food. See CALLA; JACK-IN-THE-PULPIT.

Aruwimi, *ah'roo we'me,* a large river of equatorial Africa, a main tributary of the Kongo, rising west of Lake Albert Nyanza. It flows in a westerly course through a dense and almost impenetrable forest. It has many rapids and is navigable only to Yambuya. Stanley was the first person thoroughly to explore the Aruwimi.

Ar'val Broth'ers, a college or company of twelve members elected for life from the highest ranks in ancient Rome, so called from their offering annual public sacrifices for the fertility of the fields. The college is supposed to have been instituted by Romulus. The badge of the order was a chaplet, made of ears of corn fastened together with a white band and worn on the head.

Aryan, *ahr'yan,* the name given to a branch of the human family, living originally, it is believed, in the steppes of Southern Russia. As they came to be the ruling race of India, of Persia and finally of Europe, all modern European languages have developed from the Aryan. The tendency now is to restrict the use of the term Aryan to that branch of the human race whose ancient language was Sanskrit, and to use the name Indo-European or Indo-Germanic in the wider sense.

DRAGON ARUM

As, *ahs,* or **Libra,** *le'brah,* a Roman weight, corresponding closely to the English pound, and equal to 237.5 grains avoirdupois, or 327.1873 grains, metric measure. In ancient Rome, the copper or bronze coin which was called *as,* actually weighed an *as,* or a pound, but it was

AS
Both sides of coin.

gradually reduced to barely one-thirty-sixth of its original weight.

A'sa, a great-grandson of Solomon and the third king of Judah. He died after a prosperous reign of forty-one years (917–873 B. C.) (See *I Kings* VIII, 15–24).

As'afet'ida, a vile-smelling gum. It is used in medicine to prevent spasms and to calm hysteria and other nervous attacks. It is the dried sap of a large Asiatic plant of the parsnip family. Notwithstanding its very disagreeable odor, it is used as a seasoning in the East, and sometimes in Europe.

Asaph, *a'saf,* a Levite and psalmist appointed by David as leading chorister in the divine services. He founded a school of poets and musicians which were called, after him, "the sons of Asaph." He is supposed to be the author of *Psalms* L, LXXIII–LXXXIII.

Asbes'tos, a remarkable and highly useful mineral, a fibrous variety of several members of the hornblende family, composed of separable fibers, with a silky luster. The fibers are sometimes delicate, flexible and elastic; at other times they are stiff and brittle. Asbestos is incombustible and anciently was wrought into a soft, flexible cloth, which was used as a shroud for dead bodies. Some varieties are compact and take a fine polish; others are loose, like flax or silky wool *Mountain-wood* is a variety presenting an irregular, filamentous structure, like wood. *Rock-cork, mountain-leather, fossil-paper* and *fossil-flax*, are other varieties.

Asbestos has been known for ages, but its geological history and formation are still matters of conjecture. Its attributes, too, have been known; but until about twenty years ago, very little practical use was ever made of the substance. To-day it forms one of the giant industries of the United States. The uses of asbestos are many and varied. Ground fine and combined with colors and oils in a certain manner, it makes a paint. Roofs are made by treating strong canvas with a combination of asbestos and felt, and backing it with manila paper. This substance is extensively used for factories, railroad shops, bridges and other places where there is danger of fire. Steam-pipes are covered with asbestos, and asbestos cement is used for hot-blast pipes and fire-heated surfaces. It is used for locomotive pistons, valve-stems and oil pumps. It is made into ropes and mill-boards, and in some states theaters are required to use an asbestos drop curtain to protect the audience in case of a fire in the scenery. Iron and glass workers use mittens knit from asbestos yarn. Asbestos soldering blocks are used by goldsmiths. Asbestos, in combination with rubber, is much used as an electrical insulator. Asbestos cloth is used for acid filters in all sorts of chemical processes, for the reason that no acid will eat it. Asbestos is found in Italy and Canada, and rich deposits have recently been found in Wyoming, California and Montana. At present Canada is the principal source of supply.

Asbjörnsen, *as byurn'sen,* PETER CHRISTEN (1812–1885), a distinguished Norwegian naturalist and folk-lore student. The popular tales, legends and fairy stories of his native country he collected and published as *Norwegian Folk Tales* and *Norwegian Fairy Tales and Folk Legends.* He also wrote works on zoölogical and other scientific subjects.

Asbury, *az'bur y,* FRANCIS (1745–1816), the first bishop of the Methodist Episcopal Church ordained in this country, born in Handsworth, England. He came as a missionary from England in 1771 and was made general assistant to John Wesley. In 1777 the ministers of his Church, at a conference in Maryland, decided that they should return to Europe; Asbury, alone, chose to remain. He was unanimously elected bishop and consecrated by Doctor Coke in 1784, with a fixed salary of $64 per year. His annual travels extended from Canada to the Mississippi River, and in his biography it is stated that he traveled 270,000 miles during his life, mostly on horseback.

Asbury Park, N. J., a town of Monmouth co., situated on the Atlantic coast, and on the Central of New Jersey and the Pennsylvania railroads, 6 mi. s. of Long Branch and about 80 mi. from Philadelphia. It is a noted summer resort, having, during an average season, from 20,000 to 25,000 guests. Population in 1910, 10,150.

As'calon, a ruined town of Palestine, situated on the sea coast, 36 mi. w. s. w. of Jerusalem. Formerly it was a very important place, being the seat of the Philistine worship of Astarte, whose temple was destroyed by the Scythians, 625 B. C. In the seventh century A. D., the Saracens got possession of the city. In 1099 it was taken from the Egyptians by the Crusaders under Godfrey of Bouillon, and later it was destroyed by the Saracens, but was rebuilt by Richard Coeur de Lion. Finally, in 1270, Sultan Bibars destroyed it. It is now a small village and has massive ruins.

Ascension, *as sen'shun,* an island of volcanic origin belonging to Great Britain, near the middle of the South Atlantic Ocean, 750 mi. n. w. of Saint Helena. It is retained by Great Britain mainly as a station at which ships may touch for stores. It has a naval yard, a victualing station, hospitals and a coal depot. It was discovered in 1501 on Ascension Day. Population, about 400.

Ascension. RIGHT, of a star, in astronomy, one of the factors in determining the location of a heavenly body. It corresponds nearly to longitude on the earth. The celestial equator divides the celestial sphere into northern and southern hemispheres. A certain point, the vernal equinox or first point in Aries, is established as a starting point. The right declination of any star is then found by measuring the angular distance on the celestial equator, from the fixed point to the foot of a circular perpendicular let fall from the star to the celestial equator. See DECLINATION.

Ascension Day, the day on which the ascension of Christ is commemorated, often called *Holy Thursday*. It is a movable feast, always falling on the Thursday but one before Whitsuntide.

Asceticism, *as set'e sizm,* signified among ancient philosophers the mastery of the desires and passions. It exercised a great influence over the early Christians, who practiced fasting and self-denial. Later, among the monks, it took the form of self-torture, penance and vows of poverty and celibacy; and even a disregard of personal cleanliness was considered as an aid to a holy life. Among the Protestants of to-day the objection to card-playing, the theater and dancing, as well as the teaching of total abstinence, vegetarianism and other restrictions, may be the result of ascetic tendencies. The Reformation, in its teaching that salvation was acquired through faith and not works, produced a great change in ascetic practices. Even among the Mohammedans and Catholics, fastings and self-sacrifice are growing less rigorous. See MONACHISM.

Ascham, *ays'kam,* ROGER (1515–1568), an English scholar and teacher, who rose to prominence during the reigns of Henry VIII, Mary and Elizabeth. He was educated at Saint John's College, Oxford, and became a college tutor. Later he was appointed teacher of the learned languages to Lady Elizabeth (afterwards Queen Elizabeth). Following this he became Latin Secretary to Queen Mary, and when Elizabeth acceded to the throne, was continued in the position. He is best known by his work, *The School Master,* a plain and perfect way of teaching children to speak, write and read the Latin tongue. This book was a radical departure from the methods then in vogue and greatly simplified the work and made it more interesting. Consult Quick's *Essays on Educational Reformers.*

Ascidian, *as sid'ian.* See SEA SQUIRTS.

As'gard, in Scandinavian mythology, the home of the gods, corresponding to Olympus among the Greeks.

Ash, a genus of trees that shed the leaves in the winter, have imperfect flowers, and a seed-vessel prolonged into a thin wing at the apex. There are many species, chiefly indigenous to Europe and North America. The ash is one of the most useful trees, on account of its hard, tough wood and the rapidity of its growth. There are many varieties of it, as the weeping ash, the curled-leaved ash and the entire-leaved ash. The flowering, or manna-ash, is a native of the south of Europe and Palestine. It yields the substance called manna, which is obtained by making incisions in the bark, when the juice exudes and hardens. Among the American species are the valuable white ash, with lighter bark and leaves; the red or black ash, with a brown bark; the black ash, and the blue ash. Several species not properly of this genus are popularly called ash. See MOUNTAIN ASH; PRICKLY ASH.

Ash or **Ashes,** what remains after a substance is burned. The term is usually applied to the mineral residue obtained on burning wood, coal, plants and the like. From the ashes of seaweeds are extracted bromine and iodine. Wood ashes are a source of potash, which is used as a fertilizer.

Ashanti, *a shahn'te,* a kingdom of West Africa, inland from the Gold Coast. Gold is abundant, being found both in the form of dust and in nuggets. The natives are warlike and ferocious negroes, but cultivate crops of yams, corn, rice and tobacco. The chief town is Kumassi, which has about 30,000 inhabitants. The government was formerly a despotic monarchy, but the country is now governed practically by the English, who first came in contact with the Ashantis in 1807. Hostilities continued, off and on, till 1826. Immediately after the transfer of the Dutch settlements on the Gold Coast to Britain in 1872 the Ashantis interfered and brought on a sanguinary war, leading to a British expedition in 1874, in which Kumassi was captured and British supremacy established along the Gold Coast. In 1896 another expedition was made, King Prempeh was deposed and imprisoned and the country was annexed. Another rebellion was put down in 1900.

Ash′burton, Alexander Baring, Lord, (1774–1848), a prominent English financier and diplomat. For many years before the death of his father he was in the firm of Baring Brothers, and on his father's death be became its head. While on a trip to the United States he met and married Anne Bingham, the daughter of a United States senator; and when, in 1842, the disagreement between the United States and Great Britain in regard to the northeast and northwest boundary lines had reached a crisis, Ashburton, by reason of his American marriage and his familiarity with American ideas, was appointed to attempt the readjustment of the difficulty. The Webster-Ashburton Treaty which was negotiated averted the possibility of war. See Webster-Ashburton Treaty; Webster, Daniel.

Ashe′ville, N. C., the county-seat of Buncombe co., 140 mi. e. of Knoxville, on the Southern railroad and near the junction of the French, Broad and Swannanoa rivers. The city is located in a mountainous region at an altitude of about 2300 feet, and, with its many hotels and boarding houses, has become a popular resort for both summer and winter. Points of special interest are Overlook Park, Richmond Hill, Mount Beaumont, Swannanoa drive along the river, the great Vanderbilt estate of Biltmore, and Pisgale forest, which is a hunting preserve of 84,000 acres. Asheville College for Young Women, Bingham Military Academy, Normal College and several industrial schools are located here. The region has valuable timber and some mineral wealth and produces live stock, fruits and vegetables. The city is an important tobacco market and does considerable manufacturing. It was settled in 1792. The waterworks are now owned and operated by the municipality. Population in 1910, 18,762.

Ash′land, Ky., a city in Boyd co., 144 mi. s. e. of Cincinnati, on the Ohio River and on the Chesapeake & Ohio and the Norfolk and Western railroads. Its manufactures include nails, sheet steel and steel billets, brick, leather and furniture, and it has an important trade in coal, iron ore and lumber. The place was settled in 1854 and became a city in 1870. Population in 1910, 8688.

Ashland, Ore., a city of Jackson co., on Ashland Creek and on the Southern Pacific railroad. It is the center of a fruit-growing and coal-mining region and has railroad shops, flour mills and lumber yards. There are mineral springs with medicinal properties in the neighborhood. Population in 1910, 5020.

Ashland, Pa., a borough of Schuylkill co., 12 mi. n. w. of Pottsville, on the Philadelphia & Reading and the Lehigh Valley railroads. It is in the anthracite coal field, and coal mining is the chief industry, but there are also machine shops, foundries and factories. The State Miners' Hospital is here. The municipality owns and operates its waterworks. Ashland was settled in 1850 and incorporated in 1857. Population in 1910, 6855.

Ashland, Wis., the county-seat of Ashland co., 80 mi. e. of Duluth, on the Chequamegon Bay of Lake Superior, and on the Chicago & Northwestern, the Northern Pacific, the Wisconsin Central and other railroads. The city has one of the best harbors on the lake and ships large quantities of ore and considerable lumber and brown stone. The industrial establishments include lumber mills, charcoal blast furnaces, a steel plant, foundries, railroad and machine shops. Among the important institutions and public buildings are the North Wisconsin Academy, Sisters' and Rhinehart hospitals, the Vaughn Public Library and the Knight Hotel. The beautiful Apostle Islands in the bay are of historic interest. They were occupied by the French missionaries as early as 1680. The place was settled in 1854, incorporated in 1863 and has grown rapidly since the development of the iron industry about 1876. Population in 1910, 11,594.

Ash′tabu′la, Ohio, a city in Ashtabula co., 54 mi. n. e. of Cleveland, on the Ashtabula River, 3 mi. from Lake Erie, and on the Lake Shore & Michigan Southern, the New York, Chicago & St. Louis and other railroads. It is in an agricultural and dairy region and has shaft factories, tanneries, woolen mills and farm implement works. There is an excellent harbor, and the city does a large business in the trans-shipment of coal and iron ore. The place was first settled in 1805. Population in 1910, 18,266.

Ash Wednesday, the first day of Lent, so called from a custom in the Western Church of sprinkling ashes on the heads of penitents admitted to penance that day. The custom is said to have originated with Gregory the Great. In the Roman Catholic Church the ashes are consecrated on the altar, sprinkled with holy water and then cast on the heads of the clergy and people, the priest saying in Latin, "Remember that thou art dust and to dust thou shalt return."

Asia, *a'she a,* the largest of the grand divisions of the earth, is situated between 1° 15′ and 77° 37′ north latitude, and 26° and 130° east longitude. Its greatest length from east to west is 5500 miles, and from north to south, 5100 miles, and its area, exclusive of islands, is 16,000,000 square miles, and including the islands, about 17,000,000 square miles. The continent is bounded on the north by the Arctic Ocean, on the east by the Pacific, on the south by the Indian Ocean and on the west by the Red and Mediterranean seas. The eastern and southern coasts have a number of prominent indentations. These are Bering Sea, the Sea of Okhotsk, Sea of Japan, Yellow Sea and South China Sea on the east, the Bay of Bengal and the Arabian Sea with its extension, the Persian Gulf, on the south, while to the north of the western extremity is the Black Sea, joined to the Mediterranean by the Bosporus, Sea of Marmora and Dardanelles.

The adjoining islands include the Japan Islands, the Philippines and the large group usually known as the East Indies, in which are Sumatra, New Guinea and Borneo, among the largest islands of the world. This archipelago is subdivided into numerous smaller groups. The important isolated islands are Formosa and Hongkong, off the coast of China, and Ceylon. at the southern extremity of India. The continent is separated from Europe by a mere depression, extending from the Caspian Sea northward to the Ural Mountains, which complete the boundary. During the Tertiary Period this portion of the continent was submerged, and Europe and Asia formed two separate continents (See TERTIARY PERIOD). Asia is separated from a portion of Africa by the Red Sea and the Strait of Bab-el-Mandeb and is joined to it by the Isthmus of Suez, which is about one hundred miles wide.

SURFACE AND DRAINAGE. Asia is the land of the most extensive plains, the greatest plateaus and the highest mountains in the world. The continent consists of a vast plateau in the interior, surrounded by lowlands. From this plateau numerous mountain ranges rise and extend in nearly all directions, though the prevailing trend is east and west. Most of the ranges are upon the edges of the plateau; hence they have a short and somewhat gentle slope upon the side facing the interior of the continent and a long, steep slope upon the opposite side.

The great plateau reaches its greatest elevation in Tibet, where its mean altitude is about 15,000 feet. It is bounded on the south by the Himalayas, having an extent of 1500 miles and a mean elevation of 18,000 feet, with peaks ranging from 18,000 to 29,000 feet. These are the loftiest mountains in the world. On their southern slope they descend abruptly to the plains of the Indus and the Ganges. The Plateau of Pamir forms the western boundary of the Plateau of Tibet. Pamir, though situated 1000 miles southwest of the center of the continent, seems to be the center from which the great mountain systems radiate, and it is often called by the natives "the roof of the world." From it the Himalayas extend to the southwest and the Hindu Kush to the northwest, and the Thian-Shan on the north have an east and west trend. These mountains are highest at the western extremity, where they attain an altitude of about 18,000 feet. Their mean elevation is from 10,000 to 12,000 feet. The system consists of a number of broken ranges whose extent is about 1500 miles. Near the eastern extremity and between two of these ranges is a small valley known as the Turfan depression. This little valley descends to sea level and is about three hundred miles long by one hundred miles wide. It is surrounded upon all sides by higher lands, and the reason for its formation is not easily determined. To the northeast of the Thian-Shan are the Altai and their extensions, the Yablonoi and Stanovoi, the last extending to the extreme northeastern point of the continent, and the combined ranges forming the boundary between the great central plateau and the Siberian plain. The extent of these mountains is about 3000 miles, and they diminish in altitude from the west toward the northeast. Between the Altai and Yablonoi on the north and the Kingan on the east, which extend north and south, is the Desert of Gobi.

North of the Himalaya and traversing the Plateau of Tibet are the Kuen-Lun and other mountain ranges, and to the east of the plateau are a number of nearly parallel ranges whose general trend is from northwest to southeast. The prolongation of some of these ranges forms Indo-China and the Malay Peninsula. Kamtchatka and Korea are also formed by the projection of coast ranges, a number of which are approximately parallel to the northern portion of the coast.

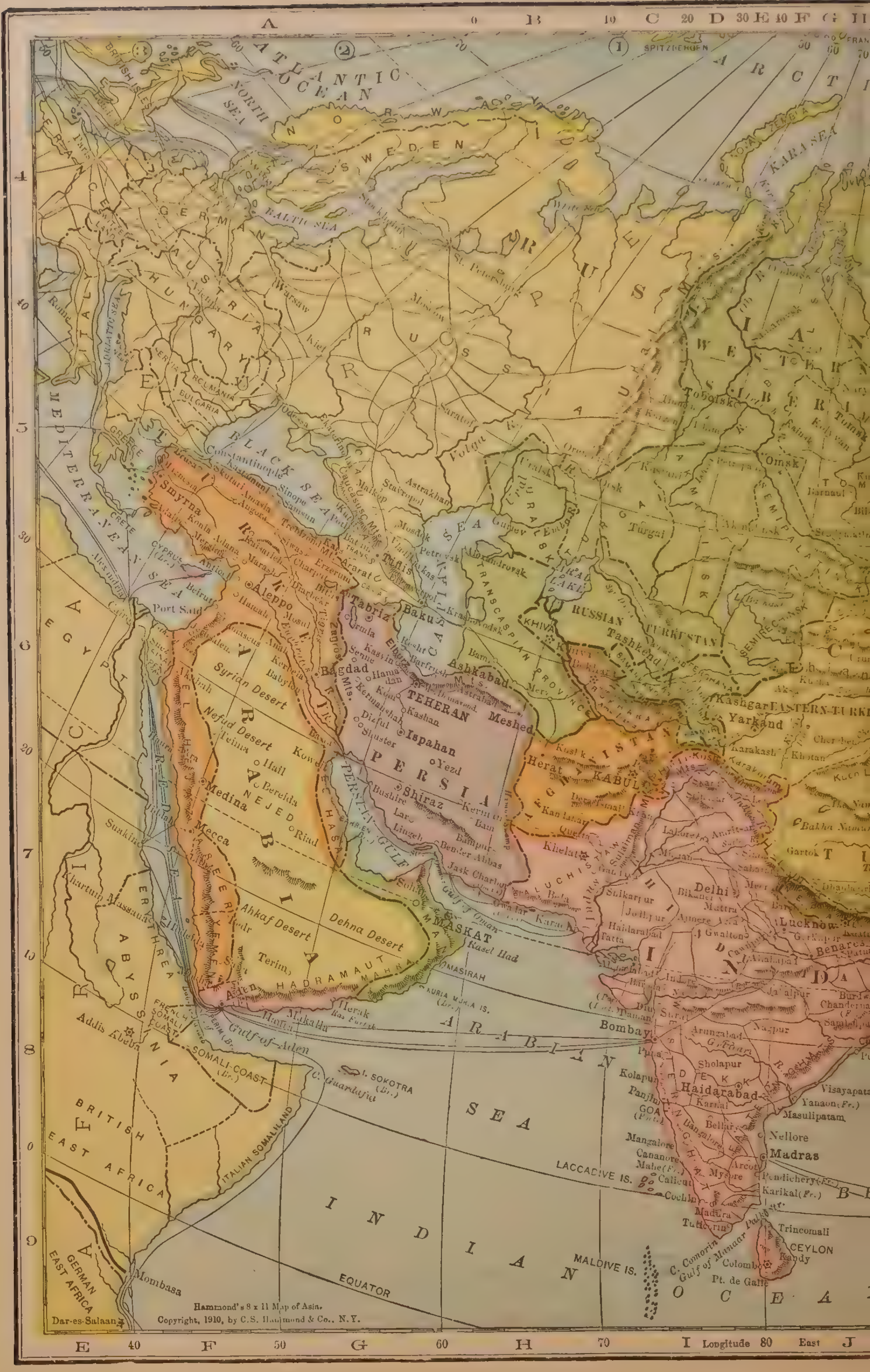
West of Pamir is the Plateau of Iran, bounded on the north by the Hindu Kush and the Elburz Mountains, which have an altitude of from 25,000 feet in the Hindu Kush to 18,500 in the Elburz. On the south of the plateau are the Zagros, a low range scarcely exceeding 6000 feet and trending to the northwest until they meet the Elburz in the region between the Caspian and Black seas. Mount Ararat, famous in Bible history, is one of the prominent peaks in this region. To the west of these ranges is the plateau of Asia Minor, which has an altitude of about 6000 feet and upon which the Taurus Mountains rest. North of the Caspian Sea are the Urals, a range of low mountains extending north and south and forming a portion of the boundary between Asia and Europe. The lowlands consist of the great depression which forms a part of the division between Asia and Europe, and in which are found the Caspian and Aral seas and a few smaller salt lakes; the great Siberian plain, extending from the Altai to the Arctic coast and having an area which exceeds that of all Europe, and the lowlands along the eastern and southern coasts and the flood plains of the great rivers, such as the Yang-tse-Kiang, Hoang-ho, Ganges and Indus.

Some of the largest rivers of Asia flow northward to the Arctic Ocean—the Obi, the Yenisei and the Lena. The Hoang-ho, the Yangtse and the Amur are the chief of those which flow into the Pacific. The Ganges, Brahmaputra, Irawaddy and Indus empty into the Indian Ocean. The Persian Gulf receives the united waters of the Euphrates and the Tigris. There are several systems of inland drainage, large rivers falling into lakes which have no outlet. The flood plains of the rivers flowing into the Pacific and Indian oceans are among the most fertile regions in the world.

The largest lake of Asia is the Caspian Sea, which receives the Kur from the Caucasus (with its tributary, the Aras, from Armenia), and the Sefid Rud and other streams from Persia (besides the Volga, from European Russia, and the Ural). The Caspian lies in the center of a great depression, being 83 feet below the level of the Sea of Azov. East from the Caspian is the Sea of Aral, which, like the Caspian, has no outlet, and is fed by the rivers Amu-Darya (Oxus) and Syr-Darya. Still farther east, to the north of the Thian-Shan Mountains, and fed by the Ili and other streams, is Lake Balkash, also without an outlet and very salt. Other lakes having no communication with the ocean are Lob-Nor, in the Desert of Gobi, receiving the river Tarim and the Dead Sea, far below the level of the Mediterranean, and fed by the Jordan. The chief fresh-water lake is Lake Baikal, in the southern part of Siberia, a mountain lake from which the Yenesei draws a portion of its waters.

MINERAL RESOURCES. The mineral resources of Asia are very extensive, though the most valuable of them have not yet been developed. The southern portion of the continent has for centuries been famous for its precious stones, such as the diamonds of Golconda, the sapphires of Ceylon, the rubies of Burma and the jade of Turkestan. In the Malay Peninsula and adjoining islands are found the richest tin mines of the world. Copper and mercury occur in Japan, coal is found in large quantities in China, and to some extent in Japan, while throughout the interior are numerous deposits of iron ore which appear to be of great value. In the eastern portion of Siberia are valuable gold mines, and the Ural Mountains contain considerable gold and are the most important source of platinum in the world. Around the Caspian Sea, and in Burma and Sumatra, are regions from which petroleum is obtained. The vicinity of the Caspian Sea yields more than the oil fields of the United States. In general, the lowlands near the coast and along the rivers are covered with a rich soil, as is a large portion of the great Siberian plain; but much of the interior is unfertile, either because of its high altitude and consequently cold climate, or for lack of sufficient moisture.

CLIMATE. Every variety of climate may be experienced in Asia, but as a whole the continent is marked by extremes of heat and cold and by great dryness, this in particular being the case with vast regions in the center of the continent and distant from the sea. The great lowland region of Siberia has a short but very hot summer, and a long, intensely cold winter, the rivers and their estuaries being fast bound with ice, and at a certain depth the soil being frozen all the year round. The northern part of China, to the east of Central Asia, has a temperate climate with a warm summer, and in the extreme north a severe winter. The districts lying to the south of the central region, comprising the Indian and Indo-Chinese peninsulas, southern China and the adjacent islands, present the characteristic climate and vegetation of the southern temperate and tropical regions, modified by the effects of altitude. Some localities in southeastern Asia



Hammond's 8 x 11 Map of Asia.
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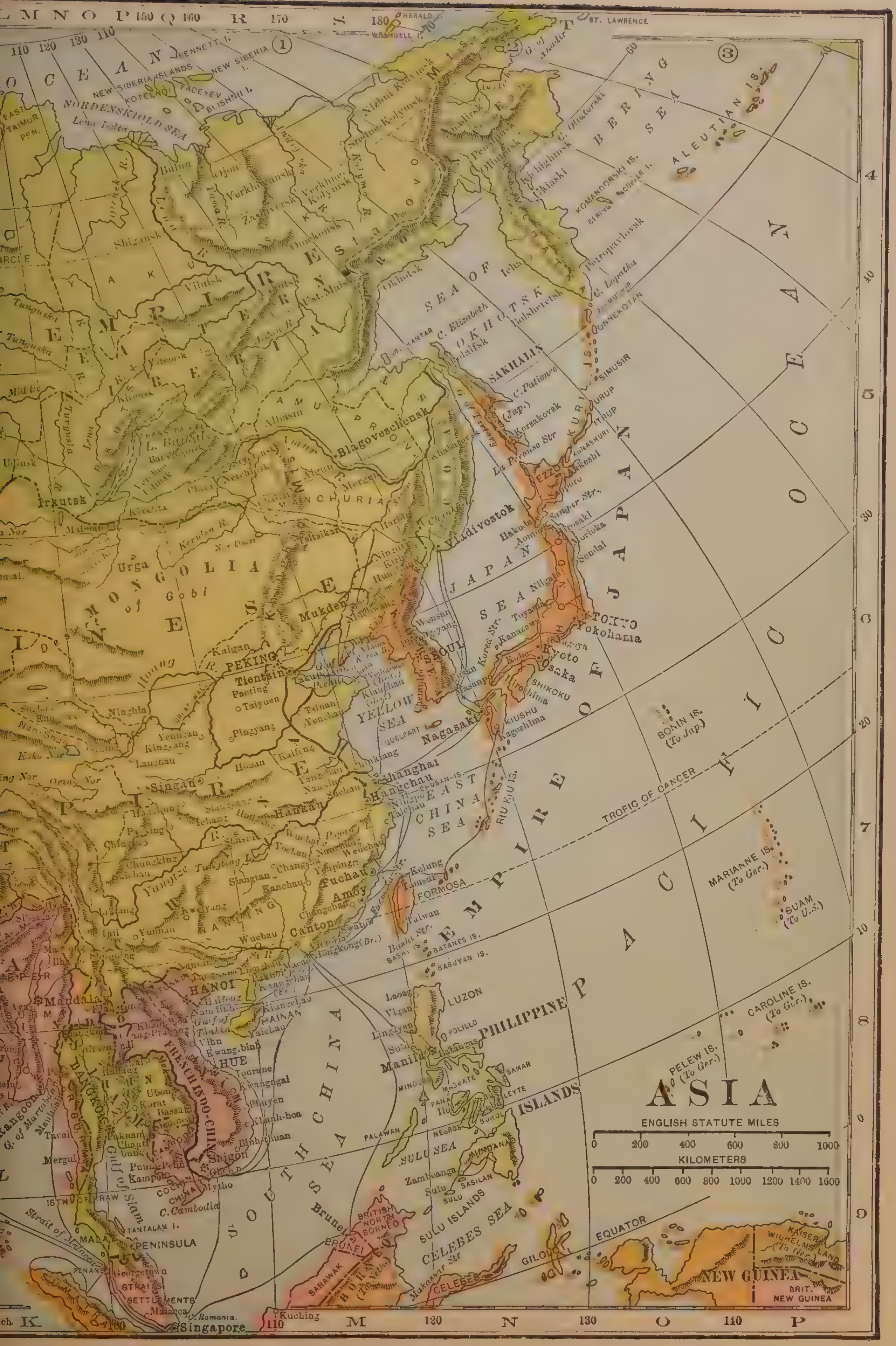
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PACIFIC OCEAN
EMPIRE OF JAPAN
BERING SEA
SEA OF OKHOTSK
SEA OF JAPAN
YELLOW SEA
EAST CHINA SEA
SOUTH CHINA SEA
SULU SEA
CELEBES SEA
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WRANGELL I.
HERALD I.
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ALEUTIAN IS.
KOMANDORSKI IS.
KAMCHATKA
Petropavlovsk
SAKHALIN (Jap.)
La Perouse Str.
KURIL IS.
EZZO
Hakodate
Sangar Str.
NIPPON
TOKYO
Yokohama
Kyoto
Osaka
SHIKOKU
KIUSHU
Nagasaki
Kagoshima
Korea Str.
SEOUL
Fusanpo
Wonsan
Vladivostok
Blagoveschensk
Irkutsk
MANCHURIA
Tsitsikar
Harbin
Mukden
MONGOLIA
Desert of Gobi
Urga
Kalgan
PEKING
Tientsin
Paoting
Taiyuen
Pingyang
Tsinan
Kaifeng
Singan
Hankau
Nanking
Shanghai
Hangchau
Ningpo
Fuchau
Amoy
Swatow
Canton
Hongkong (Br.)
Macao
Chungking
Yunnan
Kweiyang
FORMOSA
Kelung
Taiwan
Bashi Str.
BATANES IS.
BABUYAN IS.
RIU KIU IS.
BONIN IS. (To Jap.)
TROPIC OF CANCER
MARIANNE IS. (To Ger.)
GUAM (To U.S.)
CAROLINE IS. (To Ger.)
PELEW IS. (To Ger.)
PHILIPPINE ISLANDS
LUZON
Manila
MINDORO
SAMAR
LEYTE
PANAY
NEGROS
MINDANAO
PALAWAN
Zamboanga
SULU ISLANDS
BRITISH NORTH BORNEO
BRUNEI
SARAWAK
BORNEO
CELEBES
Makassar Str.
GILOLO
EQUATOR
NEW GUINEA
KAISER WILHELMS LAND (To Ger.)
BRIT. NEW GUINEA
HANOI
HAINAN
Gulf of Tonkin
HUE
FRENCH INDO-CHINA
Saigon
BANGKOK
SIAM
Gulf of Siam
C. Cambodia
Mandalay
BURMA
Rangoon
G. of Martaban
Mergui
ISTHMUS OF KRAW
MALAY PENINSULA
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Penang
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have the heaviest rainfall anywhere known. As the equator is approached, the extremes of temperature diminish till at the southern extremity of the continent they are such as may be experienced in any tropical country. Among climatic features are the monsoons of the Indian Ocean and the eastern seas and the cyclones or typhoons, which are often very destructive. See CLIMATE; WIND.

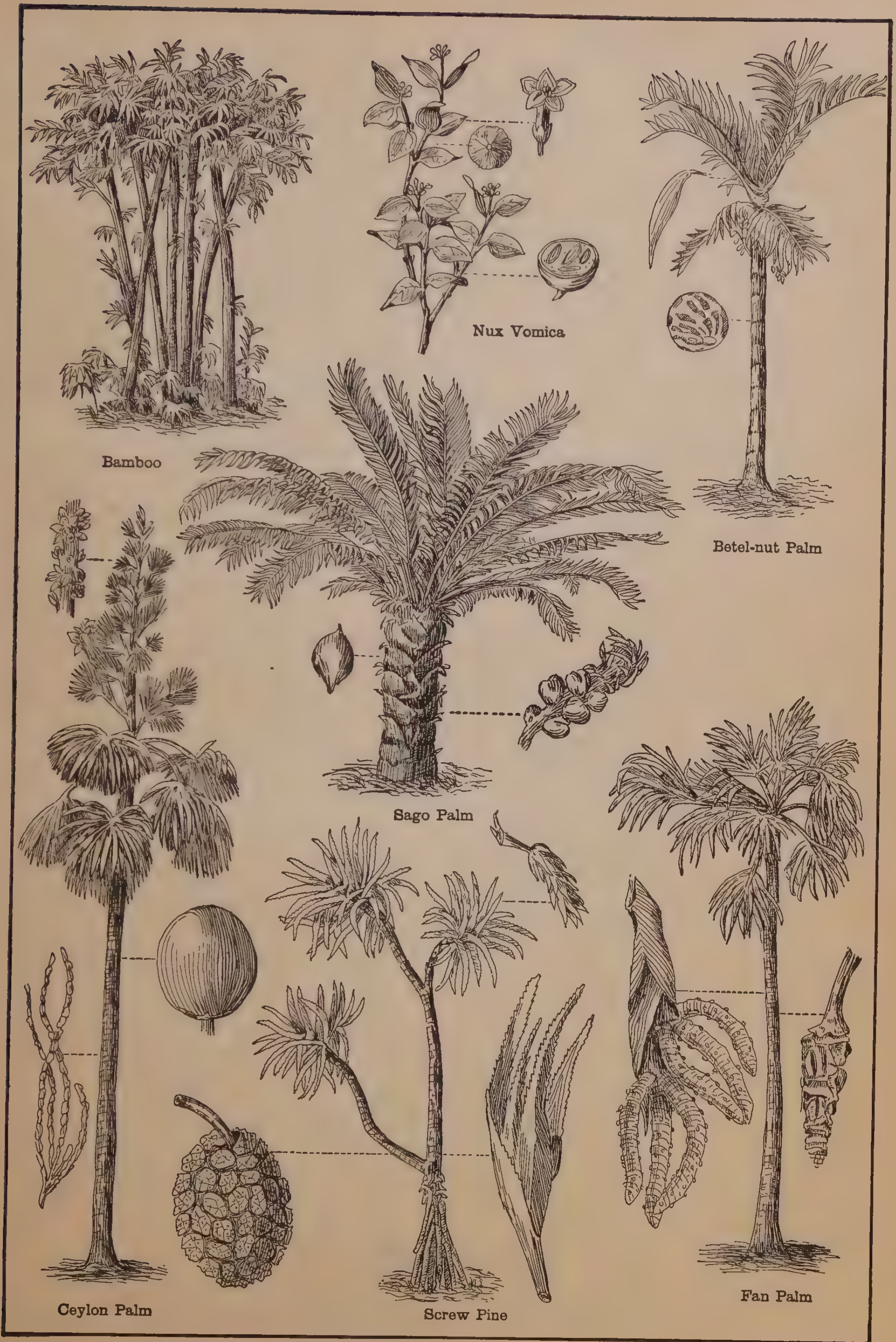
VEGETATION. The plants and animals of northern and western Asia generally resemble those of similar latitudes in Europe, differing more in species than in classes. The principal mountain trees are the pine, larch and birch; the willow, alder and poplar are found in lower grounds. In the central region European species reach as far as the western and central Himalayas, but are rare in the eastern. They are here met by Chinese and Japanese forms. The lower slopes of the Himalayas are clothed almost exclusively with tropical forms. Higher up, between 4000 and 10,000 feet, are found all the types of trees and plants that belong to the temperate zone, including extensive forests of cone bearing trees. The southeastern region, including India, the Eastern Peninsula and China, with the islands, contains a vast variety of plants useful to man and having here their original habitat, such as sugar-cane, rice, cotton, indigo, pepper, cinnamon, cassia, clove, nutmeg, banana, cocoanut, areca and sago palm, the mango and many other fruits, with plants producing a vast number of drugs, besides caoutchouc and gutta-percha. The forests of India and the Malay Peninsula contain oak, teak, sal and other timber woods, besides bamboos, palms and sandal-wood. The palmyra palm is characteristic of southern India, while the talipot palm flourishes on the western coast of Hindustan, Ceylon and the Malay Peninsula.

The cultivated plants of India and China include wheat, barley, rice, maize, millet, sorghum, tea, coffee, indigo, cotton, jute, opium and tobacco. In North China and the Japanese Islands occur large numbers of trees that shed their leaves annually, such as oaks, maples, limes, walnuts, poplars and willows. In Arabia and the warmer valleys of Persia, Afghanistan and Beluchistan, aromatic shrubs are abundant. Over large parts of these regions the date-palm flourishes and affords a valuable article of food. Gum-producing acacias are, with the date-palm, the commonest trees in Arabia.

ANIMAL LIFE. Nearly all the mammals of Europe occur in northern Asia, with numerous additions. Central Asia is the native land of the horse, the ass, the ox, the sheep and the goat. Both varieties of the camel, the single and the double humped, are Asiatic. To the inhabitants of Tibet and the higher plateaus of the Himalayas, the yak is what the reindeer is to the tribes of the Siberian plain, almost their sole wealth and support. The elephant. of a different species from that of Africa, is a native of tropical Asia. The Asiatic lion, which inhabits Arabia, Persia, Asia Minor and some parts of India, is smaller than the African species. Bears are found in all parts, the white bear in the far north, and other species in the more temperate and tropical parts. The tiger is the most characteristic of the larger Asiatic carnivora. Its habitat extends from Armenia across the entire continent, excepting, however, the greater portion of Siberia and the high table-land of Tibet. In southeastern Asia and the islands the rhinoceros, buffalo, ox, deer, squirrels and porcupines are found.

In birds, nearly every order is represented. Among the most interesting forms are the hornbill, the peacock, the Impey pheasant, the tragopan, or horned pheasant, and others of this family. It was from Asia that the common domestic fowl was introduced into Europe. The tropical parts of Asia abound in monkeys, of which the species are numerous. Some are tailed, others, such as the orang, are tailless, but none has a grasping tail like that of the American monkey. In the Malay Archipelago the animals which bear their young in an external pouch, so characteristic of Australia, first occur in the Moluccas and Celebes, while various mammals common in the western part of the Archipelago are absent. A similar transition toward the Australian type takes place in the species of birds. Of marine mammals the dugong is peculiar to the Indian Ocean; in the Ganges is found a peculiar species of dolphin. At the head of the reptiles stands the Gangetic crocodile, frequenting the Ganges and other large rivers. Among the serpents is the cobra de capello, one of the most deadly snakes in existence, and there are also large boas and pythons, besides sea and fresh-water snakes. The seas and rivers produce a great variety of fish.

INHABITANTS. Asia is mainly peopled by the Caucasian and Mongolian races. To the former belong the Aryan, or Indo-European, and the Semitic races, both of which mainly inhabit the southwest of the continent; to the latter belong the Malays and Indo-Chinese in the southeast,



PLANTS OF ASIA

as well as the Mongolians proper, Chinese and Japanese, occupying nearly all the rest of the continent. To these may be added certain races of doubtful affinities, as the Dravidians of southern India, the Cingalese of Ceylon, the Ainos of Yesso and some negro-like tribes called Negritos, which inhabit Malacca and the interior of several of the islands of the Eastern Archipelago. The total population was estimated in 1901 at about 830,558,000, or more than half that of the whole world.

Political Divisions. A large proportion of Asia is under the control of European governments.

Asiatic Russia comprises Siberia, Turkestan and Trans-Caucasia. Area, 6,395,000 sq. mi.; population, 25,000,000.

Indian Empire, including the British possessions, comprises India, the Strait Settlements and Ceylon. Area, 1,800,000 sq. mi.; population, 300,000,000.

Asiatic Turkey includes Asia Minor, Armenia, Kurdistan, Mesopotamia, Syria and the Arabian countries Hedjaz and Yemen. Area, 654,000 sq. mi.; population, 17,000,000.

The *French Possessions* include Oman, Tonking, Cambodia and Cochin-China, all within the peninsula generally known as Indo-China. Area, 25,000 sq. mi.; population, 15,000,000.

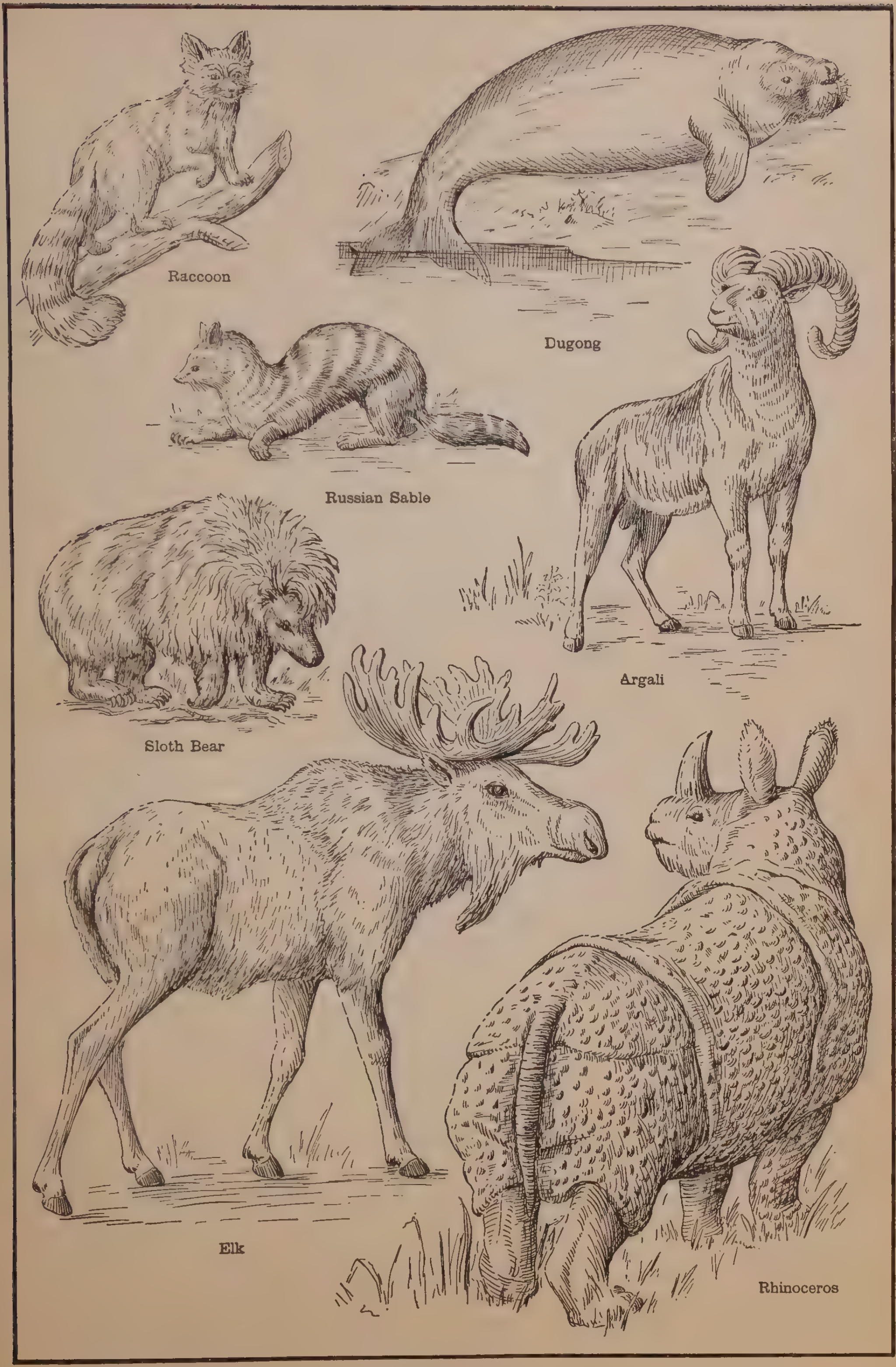
Independent Countries. The important independent countries are the Chinese Empire, including China proper, Mongolia, Manchuria, Tibet, Eastern Turkestan and Sungaria, with an area of 4,250,000 sq. mi. and a population estimated at 400,000,000; Japan, with an area of 160,000 sq. mi. and a population, including Formosa, of about 50,000,000, Siam, area, 200,000 sq. mi.; population, 9,000,000; Persia, area, 650,000 sq. mi., population, 8,000,000. Besides these there are a few small Arabian countries and the minor independent states in the Himalayas. Afghanistan and Beluchistan are quasi-independent countries, under the control of Great Britain, and Korea is under the control of Japan. Most of the large islands of the Indian Archipelago belong to the Netherlands. The remainder are divided between Great Britain, Germany and the United States.

History. Asia is generally regarded as the cradle of the human race. It possesses the oldest historical documents, and, next to Egypt, the oldest historical monuments in the world. The Old Testament contains the earliest records of any nation which we have in the form of a distinct narrative. The period at which these were written is supposed to be about 1500 years before the Christian era; but in Babylonia and Assyria, as well as in Egypt, civilization had made great advances long before this time (See Assyria; Babylonia).

The earliest seat of the Aryan race was probably in the valley of the Tigris and Euphrates rivers, whence they emigrated to the southeast and southwest, finally occupying northern India, Persia and other parts of western Asia, and spreading into Europe. China possesses an authentic history extending back to about 1000 B. C. and legends covering a long period preceding this date. Cyrus (559 B. C.) extended the Persian Empire westward to the Mediterranean, while his son Cambyses added to this Egypt and Libya. In 330 B. C. Alexander conquered Persia and brought it under his sway, but upon his death the Empire was divided into a number of separate kingdoms, which in time were dissolved by the Roman Empire. At the time the Roman power was at its greatest height, the birth of Christ occurred.

In the seventh century A. D. occurred the rise of the Mohammedans. This people soon obtained control of Persia and Syria and extended their sway into Egypt. In 1000 A. D. Mahmud conquered India and established his rule. About the same time the dynasty of the Seljuk Tartars was established in western Asia, embracing Aleppo, Damascus and Iconium, and was distinguished for its struggle with the Crusaders. The Ottoman Empire was founded in 1300. A little before this Genghis Khan, an independent Mongol chief, made himself master of central Asia, conquered northern China and overran Turkestan. From this beginning the Mongols and Mongol Tartars practically overran all of northern and western Asia, but the Ottoman Empire soon recovered from the catastrophe, and the Mongols were expelled from the West in 1453.

The Russian Cossacks conquered Siberia in the latter part of the sixteenth century, and about one hundred years later the Russians began settlements in the Caucasus. These regions have ever since remained under Russian control. In 1498 occurred the voyage of Vasco da Gama to India, and following this the Spanish, Dutch, French, Portuguese and British nations established trading posts and began settlements in different sections along the coast or on the neighboring islands. During the nineteenth century Great Britain controlled all India and subjected all of that region to the



ANIMALS OF ASIA

influence of western government and civilization. She was followed by France in Indo-China. Germany has attempted to gain foothold in the Chinese Empire and other localities, though without much success; but Russia has gained possession of a rich territory in Siberia and adjacent lands at the south.

For a detailed history of these movements, see the articles on the various countries, subhead *History*. See, also, articles under the title of each of the political divisions and the principal rivers and mountain ranges of the continent.

Asia Mi'nor. the most westerly portion of Asia, the peninsula lying west of the upper Euphrates and forming part of Asiatic Turkey. In ancient times its chief divisions were Pontus, Paphlagonia, Bithynia, Mysia, Lydia, Caria, Lycia, Pisidia, Pamphylia, Cilicia, Isauria, Cappadocia, Galatia, Phrygia and Lycaonia. The Greeks had numerous colonies in Asia Minor, and it was the assistance which Greece rendered to some of the cities of Asia Minor in their attempt to throw off Persian dominion which led to the invasion of Greece. The modern name of Asia Minor is Anatolia.

Asiento de Ambato, *a syayn'to da am bah'to.* See AMBATO.

Asp, a species of viper found in Egypt, resembling the cobra de capello or spectacle-serpent of the East Indies, and having a very venomous bite. When approached or disturbed, it elevates its head and body, swells out its neck and appears to stand erect to attack the aggressor. The balancing motions made by it in the endeavor to maintain the erect attitude have led to the employment of the asp as a dancing serpent by the African jugglers. Cleopatra is said to have committed suicide by means of an asp's bite. The name asp is also given to a viper common on the continent of Europe, and to the puff-adder of South America.

Aspar'agus, a plant, the young shoots of which, cut soon after they come from the ground, are a favorite vegetable. In Greece, and especially in the southern steppes of Russia and Poland, it is found growing wild in large quantities. The plants should be allowed to grow three years from the seed before they are cut; after that, for ten or twelve years, they will continue to afford a regular annual supply. The beds are protected by straw or litter in winter. The full-grown plant has a beautiful feathery top, shaped like a miniature tree, and it bears small flowers and bright red fruits. Some varieties are cultivated for ornament and are incorrectly known as ferns.

Aspasia, *as pa'she a,* a celebrated woman of ancient Greece. She was born at Miletus, in Ionia, but passed a great part of her life at Athens, where her house was the general resort of the most distinguished men in Greece. She won the affection of Pericles, who united himself to her as closely as he was permitted by the Athenian law, which declared marriage with a foreign woman illegal. She had a son by Pericles, who was legitimated by a special decree of the people.

As'pen, or trembling poplar, a species of poplar indigenous to Britain and to most mountainous regions throughout Europe and Asia. It is a beautiful tree, grows rapidly and is extremely hardy, and has nearly circular toothed leaves, smooth on both sides and attached to footstalks so long and slender as to be shaken by the slightest wind. The light, porous, soft, white wood is useful for various purposes.

Asphalt, *as'falt,* or **Asphal'tum,** the most common variety of bitumen, also called mineral pitch. Asphalt is a compact, glossy, brittle, black or brown mineral, which melts easily when heated, giving off a strong, pitchy odor, and which burns, when pure without leaving any ashes. The largest natural deposit of asphalt is on the island of Trinidad, in the so-called Pitch Lake. Another asphalt lake occurs in Venezuela, and the product is known as the Bermudez asphalt. Another famous body of asphalt is found in Utah known as Gilsonite, which, unlike Trinidad, is 99.5% pure hydrocarbon and is mined somewhat similar to anthracite coal. This material and the two asphalts mentioned are recognized as the standard crude asphalts for the making of paving cements and other asphaltic products. Trinidad asphalt, however, contains only about 55% bitumen. Asphalt is also found mixed with sand, or in sandstone or limestone in Cuba, California, Utah and various localities in Europe. It occurs in a liquid state in large quantity on the surface of the Dead Sea, and a fluid form, known as mineral tar, is also found in California.

The most common use of asphalt is as a material for paving streets. The Trinidad asphalt is dug when brittle by means of picks, gathered in buckets and taken directly to the vessel for shipment. Crude asphaltum cannot be used in paving streets, but must be put through a refining process, which consists principally of a slow application of heat and pre-

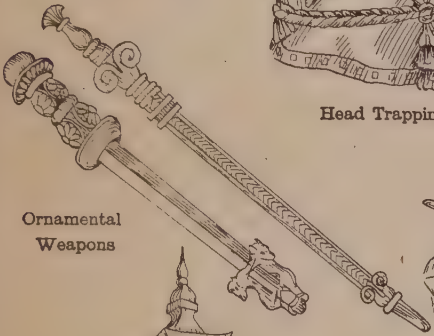
Babylonian Ruler

King's Head

Stone Vase, China

Winged Bull, Chorsabad

Head Trappings

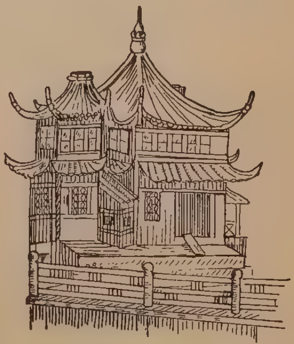


Ornamental Weapons

Palanquin

Chinese Pagoda

Chinese Junk



Chinese Gate House

ASIATIC ART AND ARCHITECTURE

cipitation. It takes three tons of the crude Trinidad material to make two tons of refined asphalt. The first step in the refining process is to place the asphaltum in great tanks and melt it down. It is necessary that the material be stirred continually during this process. A certain proportion of the residuum of petroleum is put into the asphaltum to act as a flux and melt the substance at a lower temperature than it otherwise would melt; thus all of the oils in the asphaltum are saved. This mixture, when done, is called the "paving cement." While this process is going on, sharp, clean sand is being heated to about 300 degrees in large revolving drums. This sand is mixed in a certain proportion with the above mixture, to which is then added a certain proportion of carbonate of lime. The three substances are then mixed by means of a number of iron arms revolving at a very high speed. The whole mixture, known as a "street mixture," is then taken to the street to be laid as pavement.

Before the street is ready for the asphalt there must be done a certain amount of preliminary work. The street must be carefully graded to within eight or nine inches of the proposed finished surface. It is necessary that the sub-grade be very solid and that it be rolled with a heavy steam roller. Upon this foundation is laid a bed of hydraulic concrete, made of cement, clean, sharp sand and broken stone. This, too, must be well rammed and rolled. Upon the efficiency of this preliminary work depends the value of the pavement when completed. The asphalt is usually laid on in two courses; first a cushion coat and then a surface coat. The asphalt "street mixture" is applied when it is at a temperature of about 250 or 300 degrees. The cushion coat is usually from one-half to one inch thick, and the surface coat is thick enough to make the entire sheet of asphalt two and one-half inches thick. The hot mixture is dumped into the street and spread evenly from curb to curb with hot rakes. Iron tampers and smoothers, also heated, smooth and finish the surface, which is then rolled with a hand-roller, then with a five-ton, and lastly with a ten-ton, roller. The surface coat is sprinkled with a small amount of hydraulic cement before the heavy rollers are passed over it. Asphalt made from Gilsonite is used in pavements, the same as Trinidad or Bermudez.

Rock Asphalt is mined by a simple process of blasting. The rock asphalts when used for paving are not refined, but are simply crushed, reduced to powder by heat, and then compressed in place. Aside from its use in paving, rock asphalt is also made into asphaltic cement and mastic. Mastic is prepared by mixing rock asphalt with sand and asphalt. Blocks of mastic, when melted, are used for floors, sidewalks and roofing. Asphaltic limestone is found in Utah and Kentucky. See BITUMEN.

Asphodel, *as′fo del,* a genus of lily-like plants, with fleshy roots and flowers arranged in long, loose clusters. The asphodels are fine garden plants, natives of southern Europe. The *king's spear* has yellow flowers, blossoming in June. The white asphodel was a symbol of death among the ancient Greeks, who believed that the meadows of Hades, the under world, were covered with its pale blossoms. The source of this superstition was probably the fact that in Greece the asphodel is a common weed of barren and desert places, thriving especially well in the vicinity of tombs. The bog asphodel of England and the wild asphodel of New Jersey are unrelated species. The asphodel of English poets is the daffodil.

Asphyxia, *as fix′e ah,* the condition which results when oxygen is kept away from air-breathing animals. In persons suffering from asphyxia, the blood is not purified and congests in the arteries, causing death if not relieved. The restoration of asphyxiated persons has been successfully accomplished a long time after death had apparently come, so that the work of restoration should be persistently followed without discouragement. The attempt should be made to maintain the heat of the body and to secure the inflation of the lungs, as in the case of the apparently drowned. See DROWNING.

As′pinwall. See COLON.

As′pira′tor, an instrument used to promote the flow of a gas from one vessel into another by means of a liquid. The simplest form of aspirator is a cylindrical vessel containing water, with a pipe at the upper end which communicates with the vessel containing the gas, and a pipe at the lower end, which may be closed by a stop-cock. By allowing a portion of the water to run off by the pipe at the lower part of the aspirator, a measured quantity of air or other gas is sucked into the upper part. There are several variations of this principle.

Asquith, HENRY HERBERT (1852–), an English statesman, born at Morley, Yorkshire, and educated at Balliol College, Oxford. He studied law and was admitted to the bar in 1876. In 1880 he became a queen's counsel. Six years later he was elected to Parliament from East Fife and was re-elected in 1892 and again in 1895. He introduced an amendment to the Queen's speech in 1892 which led to the dissolution of Lord Salisbury's government. He was Home Secretary in Gladstone's last cabinet and also served on the Ecclesiastical Commission. Mr. Asquith is an effective debater and during his parliamentary career he has been one of the most prominent supporters of the Liberal party. On the death of Sir Henry Campbell-Bannerman, in 1908, he succeeded him as premier.

Ass, a small animal related to the horse and the zebra. It has ears longer than those of the horse, but in shape resembling those of the zebra. The domestic ass is supposed to have sprung from a wild variety found in Abyssinia. There are numerous varieties, varying in size and strength, but all are noted for their endurance and their ability to subsist on the coarsest food, even when found only in small quantities. In the East the ass has been prized for centuries as a beast of burden and for other domestic purposes. In the United States it is but little used, except for breeding purposes. The milk is nutritious, and in some parts of Africa large herds are kept solely as milk animals. See HORSE; MULE.

Assam′, a chief province of British India; its area is 52,078 square miles. The climate is marked by heavy rainfall, and malarious diseases are common in the low grounds; otherwise it is not unhealthful. A large part of the province may be designated as forest or jungle, the trees including teak, date and sago palm and the Indian fig-tree. In the jungles roam the elephant, rhinoceros, tiger, buffalo, leopard, bear, wild hog, jackal, fox, goat and various kinds of deer. Among serpents are the python and the cobra. Pheasants, partridges, snipe, wild peacock and many kinds of water-fowl abound. Coal, petroleum and limestone are found in abundance, iron is smelted to a small extent, gold-dust is found in small quantities. The article of most commercial importance is tea, the yield of which is now over 60,000,000 pounds annually. Other crops raised are rice, indian corn, pulse, oil-seeds, sugar-cane, hemp, jute and potatoes. The population is about 6,150,000, about 4,500,000 of whom are Hindus, 1,500,000 Mohammedans, and a small part of the rest Christians. In 1826 Assam became a possession of Britain. The largest town is Sylhet, with a population of about 15,000.

Assas′sins, an Asiatic order or society which in the twelfth century became powerful in Persia and Asia Minor and terrorized the country by the systematic murder of all who were opposed to the society. Upon a select band fell the work of assassination, to which they were stimulated by the intoxicating influences of hashish (See HASHISH). From the epithet *hashishim* (hemp-eaters), which was applied to the order, the European word assassin has been derived. Rulers often made use of the services of the assassins to rid themselves of enemies.

Assault′ and Bat′tery. An assault in law is an attempt to inflict bodily injury upon another; battery is the actual infliction of the injury, or the consummation of the assault. Though the offenses are distinct and separate, they are usually committed together and punished as one. Mere words of abuse or threat are not sufficient to constitute assault; there must be the appearance at least of actual intent and ability to do violence. The least touch of another's person, willfully, negligently or in anger, may constitute battery. The use of corporal punishment by parents or teachers upon children, students or apprentices, is justifiable only to the extent that is necessary in the emergency, and any excess of violence constitutes assault and battery.

Assay′ing, the process of determining the amount of pure metal, and especially of gold and silver, in an ore or alloy. In the case of silver the assay is either by the dry or by the wet process. The dry process is called *cupellation,* from the use of a small and very porous cup, called a *cupel,* formed of well-burned and finely ground bone-ash made into a paste with water. The cupel, being thoroughly dried, is placed in a fire-clay oven about the size of a drain tile, with a flat sole and arched roof, and with slits at the sides to admit air. This oven, called a *muffle,* is set in a furnace, and when it is at a red heat the assay, consisting of a small weighed portion of the alloy, wrapped in sheet-lead, is laid upon the cupel. The heat causes the lead to volatilize or combine with the other metals and to sink with them into the cupel, leaving a bright globule of pure metallic silver, which gives the amount of silver in the alloy operated on.

Ore is assayed in a similar manner, but the ore is crushed to a powder and mixed with granulated lead. This is then placed in a crucible and covered with lead, over which borax is sprinkled. When heated, the gold and silver unite with the lead and form a metallic button, which, on cooling, gathers in the center of a mass of slag and is obtained by breaking the slag. From this button the gold and silver are obtained by cupellation.

In the wet process the alloy is dissolved in nitric acid, and to this solution is added one of common salt of known strength. This precipitates chloride of silver in the form of a white powder. The quantity of silver in this powder is determined by knowing the amount of salt used in the solution. An alloy of gold is cupelled with lead, the same as an alloy of silver, with the addition of three parts of silver to one of gold. After the cupellation the alloy of gold and silver is beaten and rolled into a thin plate, which is curled into a spike. This is put into a flask with nitric acid, which dissolves the silver. The gold is then washed, boiled with stronger nitric acid to remove all traces of silver and placed in a crucible and remelted. Assaying is carried on by the United States government, which establishes assay offices at important points in regions where gold and silver are mined. See METALLURGY.

As'signats, the name of the paper currency issued by the French government during the Revolution. The notes were to be redeemed with the proceeds of the confiscated goods of the Church, but they depreciated until they were practically worthless. They were finally redeemed by the government at one-thirtieth of their original value.

Assim'ila'tion, the appropriation of food for the growth, support and development of living tissues, takes place in the cells. In animals and man the blood in the capillaries brings to the cells the materials which they have the power of changing and so adapting to their own uses that they grow and become capable of performing new and even different functions. In order that assimilation should take place rapidly in any organ, there must be a large supply of blood. This is the case in muscle and nerve tissue, while in bone, which changes more slowly, the blood vessels or capillaries are fewer. The blood itself must circulate with a normal degree of rapidity, be of sufficient amount and composed of proper materials. There must also be taken into the system a sufficient quantity of food that is of good quality and easily digested. See DIET; NUTRITION; SECRETION.

Assin'iboi'a, a former district in Canada, forming one of the Northwest Territories. In 1905 it became a part of the two new provinces which were made. See ALBERTA; SASKATCHEWAN.

Assin'iboin (*stone boilers*), the name given to a Siouan indian tribe because when first met they boiled water by dropping hot stones into it. They lived between the Missouri and Saskatchewan, on both sides of the Canadian border. About 1400 are now on a reservation in Montana, and an almost equal number live in Canada.

Assiniboine, a river of Canada, which flows through Manitoba and joins the Red River of the North at Winnipeg, after a somewhat circuitous course of about 500 miles from the west and northwest. It is navigable for over 300 miles.

Assisi, *as se'se,* a small town in Italy, in the province of Umbria, 12 mi. s. e. of Perugia. It is the see of a bishop and is famous as the birthplace of Saint Francis d'Assisi. The splendid church built over the chapel where the saint received his first impulse to devotion is adorned with masterpieces of Cimabue and Giotto, and is one of the finest remains of medieval Gothic architecture. Population in 1901, 5548.

Asso'ciated Press, an association for the purpose of gathering news for daily papers. The Associated Press was organized in New York in 1849 and included the leading papers of that city. It is now the largest news-gathering organization in the world and maintains representatives in all the leading cities and countries. Its principal centers in the United States are New York, Cincinnati, Chicago, Saint Louis, New Orleans and San Francisco. It has the country divided into four sections—eastern, western, central and southern—and each of these divisions has a central office and a superintendent. Reports are telegraphed to the central office, and from there to all members of the association in the division.

Association Foot'ball, a form of football which originated in England and which has been growing in popularity in the United States during recent years. It is played on a field which is marked off in accordance with the accompanying diagram, and resembles the American Rugby football game in general purposes, although the method of playing is vastly different. The field, which may vary in length from 100 to 130 yards, and in width from 50 to 100 yards, is rectangular in form, and has, in the middle of each end line, two goal posts 8 yards apart and joined by a bar 8 feet from the ground. The object of the game is for one of the eleven players of one side to kick the ball between the goal posts of the opposing side. The game is played in two halves of 45 minutes each, unless otherwise agreed upon, separated by an interval of five minutes. At the beginning of the second half the players change goals.

At the beginning of the game, the football, which is spherical in form, is placed on the ground in the center of the field and kicked by a member of one team toward the opponent's goal. No one of the opponents is allowed to come within ten yards of the ball until it has been kicked off, nor is any player allowed to pass the center of the ground in the direction of his opponent's goal until the ball is kicked off. Thereafter, the players may take any position on the field they wish. When the ball goes out of bounds, it is thrown in from the point where it crossed the touch line by an opponent of the player who forced the ball out. The man throwing the ball in takes it in both hands and throws it from above his head as he stands at the line facing in. Whenever the ball is passed between the goal posts and under the bar without being thrown, knocked down or carried by a player of the opposing side, a goal is scored. If the ball strikes the goal posts or cross-bar and returns to the field, it continues in play as before. The team making the most goals in the specified time wins the game. This game may be played by more than eleven players on a side, and thus gives an opportunity to many more individuals than the American Rugby game. Moreover, as it does not call for so great an amount of strength nor entail so many injuries, it may be patronized by a different class of students and young men. It is a far better game for boys than the American game, and it is almost equally interesting after it has been well learned.

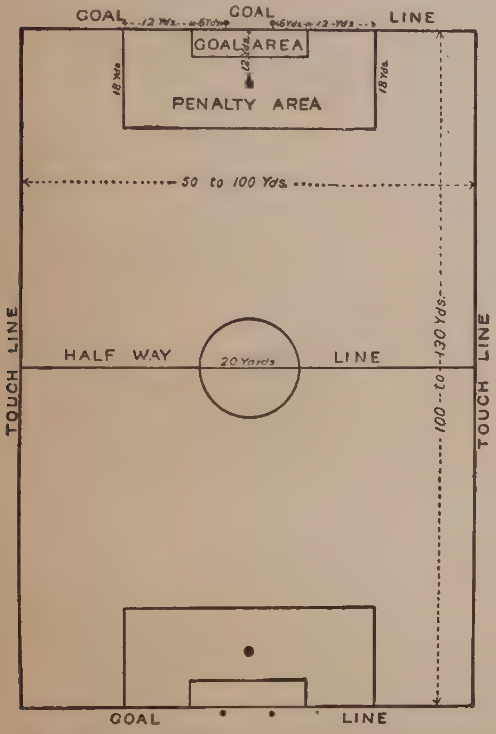


DIAGRAM OF THE FIELD IN ASSOCIATION FOOTBALL

Association of Ideas, the term used in psychology to include the conditions under which one idea is able to recall another to consciousness. Some psychologists classify these conditions under two general heads, those governed by the law of contiguity and those governed by the law of similarity. The first states the fact that actions, sensations, emotions and ideas which have occurred together or in close succession, tend to suggest one another when any one of them is afterward presented to the mind. The second indicates that present actions, sensations, emotions or ideas tend to recall their like from among previous experiences. Other laws have at times been given, but they are reducible to these. On their physical side the principles of association correspond to the physiological facts of re-excitation of the same nervous centers, and in this respect they have played an important part in the endeavor to place psychology upon a basis of positive science. See PSYCHOLOGY; HABIT; MEMORY.

Assuan, *a swahn'*, a town of Upper Egypt. on the east bank of the Nile, below the first cataract. It has a garrison and is the depot for the caravan trade with Sudan. The granite quarries of the Pharaohs, from which were procured the stones for the great obelisks and colossal statues of ancient times, are in the neighborhood. The great Nile dam, built by the British government and completed in December, 1902, adds much to the prosperity of Assuan (See IRRIGATION, subhead *Egypt*). The principal articles of trade are dates and senna. Population, about 10,000.

Assump'sit, in common law, an action to recover compensation for the non-performance of a *parole* promise, that is, a promise not contained in a deed under seal. Assumpsits are of two kinds, *express* and *implied*. The former are used in cases where the contracts are actually made in word or writing; the latter are such as the law implies from the justice of the case; for instance, employment to do work implies a promise to pay.

Assyr′ia. GEOGRAPHY. Assyria was an ancient country of Mesopotamia. It occupied the northern part of the plain and was bounded on the north by the mountains of Armenia, on the east by Media, on the south by Susiana and Babylonia and on the west, probably, by the watershed of the Euphrates. It embraced an area of about 75,000 square miles. Several mountain chains crossed the plain, which was watered by the Tigris River and its tributaries. The more fertile portion was in the east.

PEOPLE. The Assyrians resembled their Babylonian kinsmen in many respects, but were more rugged and warlike. They delighted in cruelty, and their kings were wont to boast of torturing their prisoners. Their religion was a worship of various gods representing the powers of nature. The great national deity was Asshur. Their language was almost a pure Semitic, and was expressed in writing by cuneiform symbols (See CUNEIFORM INSCRIPTIONS). They had a literature comprising hymns to the gods, mythological poems and works on astrology, law and chronology. They were ruled by a king, and their government was better organized than that of any other people of their day.

In architecture and sculpture they surpassed the Babylonians, though in the other arts and in the sciences they were inferior to them. Their buildings were of brick, but the foundations and walls were faced with stone slabs, on which were carved sculptures appropriate in subject for all the parts of the temples and palaces. Their palaces were quadrangular, with chambers grouped around three courts. The temples were pyramid-shaped. The Assyrian sculpture is remarkable for its colossal man-headed bulls and lions guarding the portals, and its decorative scenes in low-relief. The most of the reliefs are scenes of contemporary history, showing how the Assyrian soldiers marched, encamped, crossed rivers, attacked cities, cooked, tortured enemies and sacrificed to the gods. There are also some scenes of daily court life, showing the king banqueting with his queen and hunting lions with courtiers. The Assyrian sculptors knew nothing of perspective, but excelled in chiseling single figures in relief. The industrial arts were highly developed. The king and his courtiers dressed in richly embroidered and figured stuffs; their arms and armor were highly finished; the king's throne was of carved ivory and wrought gold, and he was served from superbly decorated gold, silver and bronze vessels.

HISTORY. In the ancient Greek legends, the building of Nineveh and the founding of the kingdom of Assyria are ascribed to a mythical hero, Ninus, and his queen, Semiramis (See SEMIRAMIS). But in the cuneiform inscriptions, which have recently been deciphered and are now generally considered better authority on the subject than the classical authors, the name of Ninus is not recorded, and that of Semiramis appears first in the ninth century B. C. The first settlers probably came from Babylonia not later than 1900 B. C., as the rulers, with their capital at Asshur, began to make their presence felt in Mesopotamia about 1800 B. C. They were constantly fighting for extension of territory, and toward the end of the eleventh century B. C., under the leadership of Tiglathpileser I, they gained in a large measure control over Babylonia. With this ruler began that devotion to the arts for which Assyrian monarchs were famous. After two centuries which were comparatively uneventful, there arose a strong ruler named Asurnazirpal, who waged vigorous wars on all sides and made Assyria a great empire. Nineveh, which in the eleventh century had been made the capital, rose to the position of mistress of the Eastern world. The successors of Asurnazirpal pushed their armies in a westerly direction, making conquests in Syria and Phoenicia.

THE GOD NERGAL

Sargon II was the founder of the last and most glorious dynasty of Assyria (721–606 B. C.). He completely subjugated Babylonia, overcame the Hittites, put an end to the Kingdom of Israel and made Judah and the Mediterranean cities pay tribute. His successors, Sennacherib, Esarhaddon and Asurbanipal (Sardanapalus), were kept busy maintaining the supremacy of the Assyrian power over the broad realm. Under Asurbanipal, Assyria rose to the height of its greatness; from the frontiers of India to the Aegean Sea its rule was supreme. But as the treasures of the world poured into the capital, the people became fond of ease and luxury and would not go to war to protect their foreign possessions. Province after province revolted, but Asurbanipal was a powerful monarch and managed to keep his kingdom intact. After his death, however, the decline of Assyrian power was rapid. Finally, in 606 B. C., the Babylonians under Nabopolassar, the Chaldean, with the aid of the Medes, overthrew Nineveh. Assyria was then divided between the Medes and Babylonians. See BABYLONIA; NINEVEH; also ARCHITECTURE, subhead *Chaldean-Assyrian Architecture*.

As'ter, a genus of plants of the family Compositae, including several hundred species, mostly natives of North America, although species are widely distributed in other regions. Many are cultivated as ornamental plants. Asters generally flower late in the season, and some are hence called Michaelmas or Christmas daisies. The China aster is a very showy annual, of which there are many varieties in cultivation, some with large, brilliantly colored heads that rival the chrysanthemums.

Aste'ria, a name applied to a variety of corundum, which displays a star of six rays of light, corresponding to the six-sided form of the prism in which corundum crystallizes, when cut with certain precautions; and also to the *cat's-eye*, which consists of quartz and is found especially in Ceylon.

As'teroids or **Planetoids,** a numerous group of very small planets revolving round the sun between the orbits of Mars and Jupiter, remarkable for the eccentricity of their orbits and the large size of their angle of inclination to the ecliptic. The diameter of the largest is not supposed to exceed 450 miles, while most of the others are very much smaller, one at least being only twelve miles in diameter. They number over 270, and new members are being constantly discovered. Ceres, the first of them, was discovered Jan. 1, 1801, and within three years Pallas, Juno and Vesta were seen. The extraordinary smallness of these bodies and their nearness to one another gave rise to the opinion that they were but the fragments of a planet that had formerly existed and had been brought to an end by some catastrophe. For nearly forty years investigations were carried on, but no more planets were discovered till Dec. 8, 1845, when a fifth planetoid, Astraea, was discovered in the same region. The rapid succession of discoveries that followed was for a time taken as a corroboration of the disruptive theory; but the breadth of the zone occupied makes the hypothesis of a shattered planet more than doubtful, and now each planetoid is supposed to have had an independent origin. Eros approaches the earth more nearly than any other body excepting the moon. The mean distances of the asteroids from the sun vary between 200,000,000 and 300,000,000 miles; the periods of revolution, between 1191 days (Flora) and 2868 (Hilda). Their total mass does not exceed one-fourth that of the earth.

Asthma, *as'mah* or *az'mah*, a disorder of the breathing apparatus, the symptoms of which are difficulty in breathing, returning at intervals; a feeling of weight across the chest and in the lungs; a wheezing, hard cough at first, which becomes more free toward the close of each paroxysm. Asthma is essentially a spasm of the muscular tissue which is contained in the smaller bronchial tubes. It attacks men more often than women, is often a disease of children and seems, in some instances, to be hereditary. The exciting causes are various—accumulation of blood or viscid mucus in the lungs, exposure to noxious vapors, to a cold and foggy atmosphere or to close, hot air. It frequently follows such diseases as measles and bronchitis. By far the most important part of the treatment consists in removing the exciting causes. It seldom proves fatal except as it induces dropsy, consumption or other disease.

Astig'matism, a malformation of the lens of the eye, in consequence of which the individual does not see objects in the same plane, although they may really be so. If a person suffering from astigmatism looks at black lines radiating from a center, some of them appear much brighter than others. If the difficulty is considerable it should be remedied by glasses.

As'tor, JOHN JACOB (1763–1848), an American capitalist, born near Heidelberg, Germany. In 1783 he emigrated to the United States, settled at New York and became extensively engaged in the fur trade. In 1811 Astoria, near the mouth of the Columbia River, was founded by him to serve as a central depot for the fur trade between the Great Lakes and the Pacific. He subsequently engaged in various speculations, and died worth probably $30,000,000, leaving $400,000 to found the Astor Library in New York. His descendants are the principal ground landlords of the city of New York. (See illustration on next page.)

Astor, WILLIAM (1792–1875), son of John Jacob Astor. He carried on the enormous business interests of his father and is said to have left $50,000,000. He added $200,000 to his father's bequest for a public library, besides many valuable books and documents.

Astor, William Waldorf (1848–), an American financier, son of John Jacob Astor. He was elected to the state assembly of New York in 1877 and to the state senate in 1879. From 1882–1885 he was minister plenipotentiary to Italy. He inherited the greater part of the enormous Astor estate in 1890, but ten years later he took up his residence in England.

JOHN JACOB ASTOR

Asto'ria, Ore., the county-seat of Clatsop co., 70 mi. n. of Portland, on the Astoria & Columbia River Railroad, and on the Columbia River, 9 miles from its mouth. It is the third city in size and the second city in importance in the state. The construction of a jetty has made its harbor one of the largest on the coast. There is a large export trade of lumber, wheat, flour and other products. Salmon fishing and canning are the most important industries, and there are several lumber mills, box factories, iron works and other establishments. The city has twelve churches, a public library, a hospital, a theater, a good fire department and water works Many beach and river resorts are near the city. Astoria was the first settlement in the Columbia valley, having been founded as a fur trading station by John Jacob Astor in 1811. The English held the place from 1813 to 1818, and renamed it Fort Saint George. It was chartered as a city in 1876. Population in 1910, 9599.

Astrag'alus, the upper bone of the foot, which supports the weight of the body in standing and takes part in most movements of the foot. Is is a strong, irregular-shaped bone, is connected with the others by powerful ligaments and, with the leg bones, forms the hinge joint of the ankle.

Astrakhan, *ahs tra kahn'*, a name given to a fine fur of a variety of sheep found in Bokhara, Persia and Syria, and deriving its name from Astrakhan, a city in European Russia. The fur is woolly and glossy and is tightly curled. The name is also applied to a coarse cloth which is an imitation of this.

Astrakhan, a Russian city, capital of the government of the same name, situated on a high island in the Volga, 60 mi. from the Caspian Sea. The manufactures are large and increasing, and the fisheries are very important. It is the chief port of the Caspian, and has regular steam communication with the principal towns on its shores. Population, 113,001.

Astringent, *as trin'jent,* a medicine which contracts the organic textures and canals of the body, thereby checking or diminishing excessive discharges. The chief astringents are the mineral acids, alum, lime-water, chalk, salts of copper, zinc, iron, lead, silver, and, among vegetables, catechu, kino, oak-bark and galls.

Astrol'ogy, literally, the science or doctrine of the stars. The name was formerly used as equivalent to astronomy, but is now restricted in meaning to the practice of judging of the effects and influences of the heavenly bodies on human affairs and to the foretelling of future events by the stars. As usually practiced, the whole heavens, visible and invisible, were divided by great circles into twelve equal parts, called *houses*. As the circles were supposed to remain immovable, every heavenly body passed through each of the twelve houses every twenty-four hours. The position of any planet was settled by its distance from the boundary circle of the house, measured on the ecliptic. The houses had different names and different powers, the first being called the house of life, the second the house of riches, the third of brethren, the sixth of marriage, the eighth of death, and so on. The part of the heavens about to rise was called the *ascendant*, the planet within the house of the ascendant being *lord of the ascendant*. To *cast* *a person's nativity* (or *draw his horoscope*) was to find the position of the houses at the instant of his birth. The position of the planets being determined, the astrologer, who knew the various powers and influences possessed by the sun, the moon and the planets, could predict what the course and termination of that person's life would be. The temperament of the individual was ascribed to the planet under which he was born, that is, to the planet which was lord of the ascendant at that time. If Saturn was ascendant, the person was saturnine in temperament; if Jupiter, he was jovial; if Mercury, mercurial. The virtues of herbs, gems and medicines were supposed to be due to their ruling planets.

Astron'omy is that science which investigates the motions, distances, magnitudes and various phenomena of the heavenly bodies. That part of the science which gives a description of the motions, figures, periods of revolution and other phenomena of the heavenly bodies is called *descriptive astronomy*, that part which teaches how to observe the motions, figures, periodical revolutions and distances of the heavenly bodies, and how to use the necessary instruments, is called *practical astronomy*; and that part which explains the causes of their motions and demonstrates the laws by which those causes operate, is termed *physical astronomy*. Recent years have added two new fields of investigation, which are full of promise for the advancement of astronomical science (See ASTRO-PHOTOGRAPHY; SPECTRUM ANALYSIS).

The most remote period to which we can go back in tracing the history of astronomy, the oldest of the sciences, refers us to a time about 2500 B. C., when the Chinese are said to have recorded the simultaneous conjunction of Saturn, Jupiter, Mars and Mercury with the moon. This remarkable phenomenon is found, by calculating backward, to have taken place 2460 B. C. Astronomy has also an undoubtedly high antiquity in India. The mean annual motion of Jupiter and Saturn was observed as early as 3062 B. C.; tables of the sun, moon and planets were formed, and eclipses calculated. In the time of Alexander the Great, the Chaldeans or Babylonians had carried on astronomical observations for 1900 years. They regarded comets as bodies traveling in extended orbits and predicted their return; and there is reason to believe that they were acquainted with the true organization of the universe. The priests of Egypt gave astronomy a religious character; but their knowledge of the science is testified to only by their ancient zodiacs and the position of their pyramids with relation to the cardinal points. It was among the Greeks that astronomy took a more scientific form. Thales of Miletus, who was born 639 B. C., predicted a solar eclipse, and his successors held opinions which are in many respects wonderfully in accordance with modern ideas. Pythagoras (500 B. C.) promulgated the theory that the sun is the center of the planetary system. Great progress was made in astronomy under the Ptolemies, and we find Timochares and Aristyllus employed about 300 B. C. in making useful planetary observations. But Pristarchus of Samos, who was born 267 B. C., is said, on the authority of Archimedes, to have far surpassed them, by teaching the double motion of the earth around its axis and around the sun. A hundred years later Hipparchus made important discoveries and even undertook a catalogue of the stars. It was in the second century after Christ that Claudius Ptolemy, a famous mathematician of Pelusium in Egypt, propounded the system that bears his name; viz., that the earth was the center of the universe, and that the sun, moon and planets revolved around it in the following order: nearest to the earth was the sphere of the moon; then followed the spheres of Mercury, Venus, the Sun, Mars, Jupiter and Saturn; then came the sphere of the fixed stars; these were succeeded by two *crystalline* spheres and an outer sphere, which last was again circumscribed by the *coelum empyreum*, of a cubic shape, wherein happy souls found their abode. The Arabs began to make scientific astronomical observations about the middle of the eighth century, and for 400 years they prosecuted the science with assiduity. Ibn-Yunis (1000 A. D.) made important observations of the disturbances and eccentricities of Jupiter and Saturn. In the sixteenth century Nicholas Copernicus, born in 1473, introduced the system which bears his name, and which gives to the sun the central place in the solar system and shows all the other bodies revolving around it. This arrangement of the universe came at length to be generally received, on account of the simplicity it substituted for the complexities and contradictions of the theory of Ptolemy. The observations and calculations of Tycho Brahe, a Danish astronomer, born in 1546, continued over many years, were of the highest value, and won for him the title of regenerator of practical astronomy. His assistant and pupil, Kepler, born in 1571, was enabled, principally by the aid he received from his master's labors, to arrive at those laws which have made his name famous: 1, That the planets move, not in circular, but in elliptical orbits, of which the sun occupies the position of a focus; 2, that the radius vector, or imaginary straight line joining the sun and any planet, moves over equal spaces in equal times; 3, that the squares of the times of the revolutions of the planets are as the cubes of their mean distances from the sun. Galileo, who died in 1642, advanced the science by his observations and by the new revelations he made through his telescopes, which established the truth of the Copernican theory. Newton, born in 1642, carried physical astronomy suddenly to comparative perfection. Accepting Kepler's laws as a statement of the facts of planetary motion, he deduced from them his theory of gravitation. The science was enriched toward the close of the eighteenth century by the discovery by Herschel of the planet Uranus and its satellites, the resolution of the Milky Way into myriads of stars, and the unraveling of the mystery of nebulae and of double and triple stars. The splendid analytical researches of Lalande, Lagrange, Delambre and Laplace mark the same period. The nineteenth century opened with the discovery of the first four minor planets, and of the existence of another planet (Neptune) more distant from the sun than Uranus. Of late years the sun has attracted a number of observers, the spectroscope and photography having been especially fruitful in this field of investigation. From recent transit observations the former calculated distance of the sun has been corrected, and is now given as 92,560,000 mi. An interesting recent discovery is that of the two satellites of Mars. The existence of an intra-Mercurial planet, which has been named Vulcan, has not yet been verfied. Much valuable work has of late been accomplished in ascertaining the parallax of fixed stars. See ASTEROIDS; COMETS; EARTH; MOON; PLANET; SOLAR SYSTEM; STARS; SUN, and the many topics referred to in these articles. See, also, the names of the principal astronomers referred to.

There are a number of interesting books on astronomical topics, among which are Proctor's *Other Worlds than Ours* and *Half Hours with the Stars*, and Flammarion's *Astronomy for Amateurs*.

Astro-Photog′raphy, the use of the photographic camera in the study of the heavens. In 1840 Draper obtained a photograph showing the formations on the surface of the moon. This was probably the first really successful photograph of any part of the sky; but since that time photography has come to be one of the most important aids the modern astronomer has. The sensitive plate and the lens make no errors in recording their observations, and by various processes these observations are made intelligible and can be studied at leisure without the interruptions that occur when the heavenly bodies are being studied through the telescope.

Asuncion, *a soon′the on,* the capital of Paraguay, situated on the Paraguay River, about 650 mi. n. of Buenos Ayres. The most important buildings are the cathedral, several other churches and convents and the government buildings, including the president's palace, houses of congress, arsenal and custom house. The city also has a college and a hospital. The principal trade is in tobacco, fruits, Paraguay tea, hides, provisions and manufactured goods. It is a good river port and numerous steamers and sailing vessels are found in its harbor. It was founded in 1877 on the Feast of the Assumption; hence its name. Population in 1900, 51,700.

Atacama, *ah′tah kah′ma,* a desert region on the west coast of South America, belonging to Chile. It forms the chief mining district of Chile, containing silver, gold, lead, copper, nickel, cobalt and iron mines. It has an area of 28,350 square miles and a population of 69,372.

Atahualpa, *ah′ta wahl′pa,* the last of the Incas, succeeded his father in 1529 on the throne of Quito, while his brother Huascar obtained the kingdom of Peru. They soon made mar against each other; the latter was defeated and his kingdom fell into the hands of Atahualpa, who took terrible vengeance on his opponents. At this juncture the Spaniards under Pizarro appeared and by a trick seized Atahualpa, who offered a vast ransom in gold. Huascar offered a greater sum, and Atahualpa in retaliation caused his brother to be killed. Pizarro secured the ransom and then, after accusing Atahualpa of treason, had him quickly tried and executed. See INCA; PIZARRO, FRANCISCO.

At′alan′ta, in the Greek mythology, a famous huntress of Arcadia. She was to be obtained in marriage only by him who could outstrip her in a race, the consequence of failure being death. One of her suitors obtained from Venus three golden apples, which he threw behind him, one after another, as he ran. Atalanta stopped to pick them up, and was not unwillingly defeated. There was another Atalanta belonging to Boeotia, and the two cannot very well be distinguished, as the same stories were told about both.

Atchafalaya, *ach'a fa li'ah* (Lost Water), a river of the United States, an outlet of the Red River. It branches off before the junction of the Red River with the Mississippi, flows southward, and enters the Gulf of Mexico by Atchafalaya Bay. Its length is 220 miles, the greater part of which is navigable.

Atcheen'. See ACHIN.

Atch'ison, KAN., the county-seat of Atchison co., 49 mi. n. w. of Kansas City Mo., on the Missouri Pacific, the Rock Island and the Burlington railways. The city has an extensive trade in grain, flour, livestock, produce and fruit, and contains important railroad shops, lumber mills, factories, foundries and brickyards. It is the seat of the State Soldiers' Orphans' Home and several denominational schools of importance. Population in 1910, 16,429.

Ath'abas'ca, a former district of Canada, belonging to what was known as the Northwest Territories. In 1905 it was made a part of the provinces of Alberta and Saskatchewan. See ALBERTA; SASKATCHEWAN.

Athabasca Lake, a large lake in Canada, situated in the northern part of the provinces of Alberta and Saskatchewan. It is about 200 miles long and 35 miles wide at its broadest part. Its waters are carried to Great Slave Lake through Great Slave River. The northern shore is high and timbered with fir, spruce and poplar. The southern shore is low and level.

Athabasca River, a river of Canada, rises in the northwestern part of Alberta, in the Rocky Mountains, and flows northeasterly and then easterly into Athabasca Lake. Its length is about 600 miles.

Ath'ali'ah, daughter of Ahab, king of Israel, and wife of Jehoram, king of Judah. After the death of her son Ahaziah, she opened her way to the throne by the murder of forty-two princes of the royal blood. She reigned six years; in the seventh, the high priest Jehoiada placed Joash, the young son of Ahaziah, who had been secretly preserved, on the throne of his father, and Athaliah was slain (*II Kings*, XI). This story is the foundation of a famous tragedy, *Athalie*, by Racine.

Athanasius, *ath an a'zhe us,* SAINT (about 293–373), bishop of Alexandria for forty-seven years and the most prominent churchman of his times. He was known as the most ardent opponent of the Arian heresy and was the target of the fierce opposition of his enemies, who accused him of all manner of crimes, of which, however, he is now deemed wholly innocent, though he was condemned by partisan synods. No less than five times he was exiled by the emperors, and during these periods he resided in Rome and visited many European provinces. The last seven years of his life were spent in enjoyment of his victory over the heretics who had opposed him. He was a vigorous writer of many works, which are now regarded as authoritative in the Church, and which serve as valuable material for the modern historian.

Ath'apas'can Indians, a great family of North American indians who lived in that vast region which extended from Alaska through British North America to the northern boundary of the United States, and, in isolated groups south as far as Mexico. A single tribe living near Lake Athabasca bore this name. The Chinook, Apache and Navajo are Athapascan. The language of these scattered tribes was practically the same. With the exception of the Navajo and Apache, they have not been warlike tribes. Those of the north lived by hunting and fishing, while the tribes of the Pacific coast lived in permanent villages.

A'theism, the doctrine that denies the existence of God. Atheism is contrary to the instincts of man, yet doubtless there have been individuals who sincerely believed that no God is possible. Agnosticism, which is sometimes confounded with atheism, merely professes ignorance of God.

Ath'elstan (895–940), king of England, succeeded his father, Edward the Elder, in 925. He was victorious in his wars with the Danes of Northumberland and the Scots, by whom they were assisted, and after his great victory at Brunanburh he governed in peace and with great ability. He was the first to call himself king of England.

Ath'enae'um, the temple of Athene (or Minerva) at Athens, where poets and men of letters met and read their productions. The same name was given at Rome to the school which Hadrian established on the Capitoline Mount for the promotion of literary and scientific studies, and provided with a regular staff of professors. Similar institutions were established at Lyons, Marseilles and other places. In modern times the same name is given to literary clubs and establishments connected with the sciences.

Athe'ne. See MINERVA.

Ath'ens, the capital of the kingdom of Greece and formerly the center of Greek culture and the capital of Attica. Athens is situated in a plain about 5 miles from the harbor of Piraeus, on the Gulf of Aegina. It is 350 feet above sea level and enjoys a dry and warm climate.

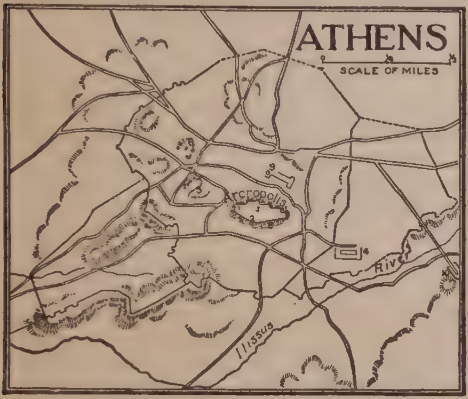
ANCIENT ATHENS. When one speaks of ancient Athens, one means Athens in the time of Pericles, rather than Athens throughout the period of its long growth or the subsequent period of decay. In the Age of Pericles, then, Athens was a strong walled city, built about the Acropolis, which was a rocky elevation about 300 feet above the level of the city, having on its summit a comparatively level area of somewhat less than ten acres. It was accessible only on the west, where a stairway of sixty marble steps led to a series of colonnades and porticoes called the Propylaea, or Gateway. This was a magnificent structure built of white Pentelic marble and trimmed with black marble. Just within the entrance was the colossal statue of Athena, the patron and defender of the city. On the right, and a little to the rear, was the Temple of the Wingless Victory (Nike Apteros), and to the right of the open space rose the Parthenon, an exquisitely beautiful temple dedicated in 438 B. C. It was entirely of fine Pentelic marble and was the sacred abode of the goddess Athena, in whose honor it was erected (See PARTHENON). To the left of the entrance stood the Erechtheum, a beautiful temple of which there still remains the famous Porch of the Maidens (See CARYATIDES). The city surrounded the Acropolis on every side, extending to a distance of about a mile therefrom. To the north and directly in front of the Acropolis was the Tower of the Winds, a beautiful structure erected in 159 B. C. and still well preserved. To the west were the Hill of the Nymphs and the Areopagus (Mars Hill), the rocky eminence from which Paul is supposed to have preached to the Athenians. To the northwest lay the Theseum, a beautiful temple which is still in a fine state of preservation. On the southwest slope of the Acropolis was the ancient Theater of Dionysus, and beyond it the stately Olympieum, begun about 535 B. C., but not finished until seven hundred years later. Under the Romans, Athens was a flourishing city which in the second century Hadrian ornamented with many new buildings; but after that time much of the beauty of the city was destroyed, the Parthenon was lost to pagan religion and became a church of the Virgin Mary. In 1456 Athens fell into the hands of the Turks, and the Parthenon became a mosque. During the siege of Athens by the Venetians in 1687 this beautiful building was greatly damaged by an explosion, but enough of it was left to attest its original splendor.

MODERN ATHENS. Modern Athens, laid out by King Otto in 1835, lies principally to the north of the Acropolis. It is built in the form of a crescent and has broad boulevards and a number of handsome public buildings, of which the most interesting are the royal palace, the national museum and the new public library. An elegant Stadium has been erected, in which the modern Olympic games are celebrated. Railroads have been laid in the principal streets, and the city is connected by rail with the Piraeus and with Patras.

There are in the city many museums, some of which contain very valuable collections of antiquities, which are being increased by the continual studies and excavations that are going on throughout Greece. The city has good schools and a large university with over 3000 students. Archaeological schools are maintained by the United States, England, France and Germany. Athens, though it is the financial center of Greece, does but little manufacturing, and engages only in domestic trade. Rugs, silks, scarfs, brass and copper ware are among its most important native manufactures. The population in 1907, 167,479.

HISTORY. According to tradition, the founder and first king of Athens was Cecrops. Theseus, who united under his leadership the twelve independent townships of Attica, was the most famous of the early Athenian kings and the favorite national hero. The last king was Codrus, whom it was felt there was no one worthy to succeed, and the state was accordingly organized as an oligarchy, with an executive officer known as the *archon*. The number of archons was later increased to nine. The aristocratic form of government grew to be very unsatisfactory to the people, because the rulers, bound by no written laws, could practice any oppressions they chose, and the lower classes finally revolted and demanded written laws. Draco, one of the archons, drew up a code of laws (See DRACO), but the people saw that these old laws were thoroughly inadequate and demanded new ones, which were accordingly formulated by Solon (See SOLON). In 561 B. C., Pisistratus, by the aid of a dissatisfied class in the state, made himself tyrant of Athens, and the city prospered under his rule and that of his sons, Hippias and Hipparchus, who succeeded him.

In 509 B.C. a new constitution, proposed by Clisthenes, was adopted, and under it a democratic government was set up. This new constitution introduced little that was new into the government of Athens, but provided for the new conditions which had grown up since the constitution of Solon was formed. Athens was divided into one hundred divisions called *demes*; each citizen was enrolled in one of these divisions and took his surname from the deme, instead of from his clan. Ten of the demes, not adjacent, but scattered as widely as possible so as to include the various local interests, composed a *ward*, and thus the political unity of the old clans was destroyed. Many of the aliens throughout Attica were under this new constitution enrolled as citizens.



1, Propylaea; 2, Parthenon; 3, Erechtheum; 4, Olympieum; 5, Areopagus; 6, Theseum; 7, Odeum; 8, Temple of Dionysus; 9, Tower of the Winds; 10, Stadium.

The aid which Athens sent to the Ionian colonies in Asia Minor in 499 brought on the Persian wars (See Greece, subhead *History*), and at the close of this struggle Athens found herself the leader of Greece. The Confederacy of Delos, organized in 476 for the purpose of freeing Greek colonies from Asiatic control, became in time a consolidated empire with Athens as its capital. The fifty years which followed were the most brilliant in Athenian history; especially under Pericles was Athens the literary and artistic center of the world (See Pericles).

In 431 Sparta, jealous of the position of influence which Athens held as head of the Delian League, demanded that Athens free all of the Greek cities. Athens in reply demanded that Sparta let go her own conquests in the Peloponnesus, and the result was the Peloponnesian War (See Greece, subhead *History*. At the close of this conflict, Athens was deprived of much of her power, and her democratic government was replaced by an oligarchy under the Thirty Tyrants (See Thirty Tyrants). Although even under the reëstablished democracy Athens never regained her former political position, she remained the intellectual center of Greece. After Philip of Macedon had conquered Greece (338 B.C.), Athens was still the center of Hellenic culture, until rivaled by Alexandria in the second century B.C. Under Roman rule, the city was greatly favored by some of the emperors, especially Hadrian, who built up a new quarter in the northwest of the city. From the time of Justinian, who closed the schools of philosophy at Athens, until the eleventh century, the history of Athens is almost a blank. During the twelfth, thirteenth and fourteenth centuries she was sometimes independent and at other times subject to some Italian city or to Turkey. Turkish rule was firmly established late in the seventeenth century and continued until after the Greek revolution in 1835, when Athens became the capital of the new kingdom of Greece.

Athens, Ga., the county-seat of Clarke co., 73 mi. n. e. of Atlanta, on the Oconee River, and the Georgia, the Central of Georgia and the Seaboard Air Line railroads. The city has an extensive cotton trade and has cotton mills and other manufactures. It is the seat of the University of Georgia, the State College of Agriculture, the State Normal and the Lucy Cobb Institute for Girls. The city was founded in 1800 as the seat of the state university. Population in 1910, 14,913.

Athlet'ics. Definition. Athletics is a term used to cover a great variety of indoor and outdoor sports, though often restricted to those miscellaneous sports of the track and field which take the form of personal contests. This article considers the term in its latter sense. The more important athletic games are described under separate titles in their proper places (See Basket Ball; Baseball; Football; Lawn Tennis; Hockey; Polo; and so forth). In the United States the chief popular interest is in the athletic sports in schools and colleges, most of which support regular teams made up of students, and hold meets with their neighbors in their gymnasiums in the winter and out-of-doors in the warmer seasons. A marked distinction is drawn between the professional athlete who enters contests for pay and the amateur who enters for sport only. In all schools and colleges the sports should be purely amateur. Efforts are always made to keep them so. An amateur in this sense is "any person who has never competed in an open competition or for public money, or for admission money, or with professionals for a prize, public money or admission money; nor has ever at any period of his life taught or assisted in the pursuit of athletic exercise as a means of livelihood; nor is a mechanic, artisan or laborer."

ATHLETIC SPORTS. The usual sports of an athletic meet may be classified as those of the track and those of the field, the former being held in a circular track, or cinder path, enclosing the inner field where the latter sports are held. The *track events* consist of races, which are the sprints of 50 yards, 100 yards, 440 yards and the long-distance runs of one-half mile, 1 mile and 2 miles, and the hurdle races. The *field events* are the high jumps and the broad jumps, the pole vault, the shot put, the hammer throw and the discus throw.

The *hurdle races* are usually two in number: one for 120 yards, over 10 hurdles, each 3 feet, 6 inches high; and the other of 220 yards, over 10 hurdles, each 2 feet, 6 inches high. In the race over high hurdles, the first is 15 yards from the starting line; each hurdle is 10 yards from its neighbor, and the tenth is 15 yards from the finishing line. In the low hurdle race, the hurdles are distributed at intervals of 20 yards throughout the course. A hurdle race requires great skill and endurance, as well as high speed. While the hurdler may run the first stretch and the last stretch as he pleases, he must, if he is to succeed at all, take always exactly the same number of steps between hurdles and jump over them in precisely the same way each time. The record for the low hurdles is about 23⅗ seconds; for the high hurdles, about 15½ seconds.

In making a *pole vault* the athlete takes the pole, which is usually at least 16 feet long, and, measuring the height of the bar with his eye, takes hold of the pole at the proper height and goes back for his run. With the long pole extending forward, he runs down to the "take-off," and puts the iron-shod end of the pole into the ground and leaps upward, throwing his feet above his head and pushing his body up at arm's length till he is above the cross-bar. Then, with a quick motion, he throws the pole from him and himself over the bar. In each competition three trials are allowed at every height at which the bar is placed. The amateur record for pole vault is somewhere near 11 feet, 11 inches.

The *shot put* consists in throwing or putting a 16-pound shot forward from the shoulder. It is not a throw exactly, but a push forward and upward. The competitor, who stands within a circle 7 feet in diameter, must not step outside in the course of his throw. The measurement is made from the circumference of the circle to the spot where the shot first broke ground. A 12-pound shot is the customary size in high school contests. The record for the 16-pound shot is about 49½ feet; the high school record for the 12-pound shot is about 44½ feet.

Hammer throwing is made under conditions similar to those of the shot put. The hammer, with its handle, must not exceed 4 feet in length, nor its total weight exceed 16 pounds. The head of the hammer is usually a spherical shot, and the handle, a chain with a wooden or metal attachment for the hands. The contestant, standing within his 7-foot circle, swings the hammer around his head to gain momentum and then throws it with the force of his body. The record for the 16-pound hammer is about 172 feet.

The *discus throw* is made from a 7-foot ring and is measured in the same way that the shot put and hammer throw are measured. The discus itself is of smooth, hard wood, weighted with lead in the center and capped with brass disks and a steel ring, and should not exceed 8 inches in diameter nor 2 inches in thickness at the center. Its weight is 4½ pounds. The discus is taken in the fingers of the right hand with the flat side lying against the palm of the hand and wrist, and with a whirling motion and a long, full-arm swing the discus is thrown. The record for the discus throw is about 140 feet.

TRAINING. Each particular form of athletic exercise requires special training, if a person is to excel in it. Not only must the athlete do over and over again the things he expects to excel in, but he must learn the best ways of doing everything and must train himself to do them with the least possible expenditure of energy. It is here that the coach is best able to help the aspiring athlete. There are, however, some things which must be learned and done, no matter what the sport or game the person is to enter:

The *clothing* should be adapted to athletic contests; it usually consists of a shirt and knee pants of light cloth, thick stockings and shoes suitable for running on the road. A sweater or blanket is a necessity for use after exercise, in order to prevent taking cold. The rubber-soled gymnasium shoes are good for road work, though a light leather shoe is preferred.

The *exercise* should be general and not confined to the forms of exertion that are necessary in the particular contest. Anything that develops general strength and agility is an aid in any special contest. It is a serious mistake to try frequently to make a record for one's self; that is, to run at full speed over the entire course in which the competition is to take place, to throw the hammer as far as possible or to jump as high as one can. After two or three weeks of general exercise and trials of the event at a moderate pace, the person may safely, as often as once or twice a week, do his best without fear of injury. Some good athletes never attempt to make a record except in competition.

Proper *diet* is essential to any person's physical well-being. It is not necessary that a person should deny himself the things he likes to any great extent, or punish himself with a rigidly selected diet, but he should have good, wholesome, well-cooked food and plenty of it. Rich pastries and heavy, indigestible foods of all sorts should be excluded. He should be regular in his habits, and he should remember that tobacco and liquors and everything that overstimulates bring a reaction that is injurious.

Bathing is another important factor in athletic training. Every time after a person has been heated in exercise, he should take a shower bath or a sponge bath, and then rub himself thoroughly dry with a coarse towel. If a shower bath is used, a person should be careful not to turn on too cold water or to stay under the shower too long. On the other hand, if the water is too warm, it is debilitating in its effect. A cold sponge bath in the morning is always invigorating and never weakening.

Sleep is another of the important things connected with training. At least eight hours a night of good sound sleep are essential, and it is infinitely better if this sleep can be taken at regular hours. To retire early and have several hours of sound sleep before midnight is much better than to prolong rest the following morning.

Ath'ol, Mass., a town in Worcester co., 44 mi. n. w. of Worcester, on the Boston & Albany and the Boston & Maine railroads. It has suburban electric railways and contains manufactures of cotton goods, shoes, tools, furniture and other articles. The place has two national banks, a public library and a high school. It was settled in 1735 and was called Pequoig until its incorporation in 1762. Population in 1910, 8536.

Athor, *ah'thor,* or **Hathor,** an Egyptian goddess, identified with Venus. Her symbol was the cow bearing on its head the solar disc and hawk-feather plumes. From her the third month of the Egyptian year derived its name.

Ath'os, Mount (called by modern Greeks, Holy Mountain), a mountain of Turkey, 6350 feet high, terminating the most eastern of the three peninsulas known as Chalcidice, jutting into the Archipelago. In a broader sense the whole peninsula is called Athos. The Persian fleet under Mardonius was wrecked here in 493 B. C., and to avoid a similar calamity during his invasion, Xerxes caused a canal, of which traces may yet be seen, to be cut through the isthmus that joins the peninsula to the mainland. On the peninsula there are situated about twenty monasteries and a multitude of hermitages, which contain from 6000 to 8000 monks and hermits of the order of Saint Basil. Athos was the center of Greek learning and theology, and the libraries of the monasteries are rich in literary treasures and manuscripts. The revenue of the community is derived from pilgrims and from a considerable trade in amulets, rosaries, crucifixes, images and wooden furniture.

At'jeh. See Achin.

At'kinson, Edward (1827–1905), an American economist and statistician. He invented the "Aladdin Oven," an improved cooking stove, and wrote extensively on economic subjects, on which he was considered a high authority.

Atlan'ta, Ga., the capital of the state, and the county-seat of Fulton co., 294 mi. n. w. of Savannah, and 171 mi. w by n. of Augusta, on five lines of the Southern Railroad, and on the Seaboard Air Line, the Western & Atlantic, the Central of Georgia, the Atlantic & Birmingham and other railroads. It is the largest city of the state and one of the most important railroad centers in the South. The city covers an area of about twelve square miles and is laid out in the form of a circle, with a radius of one and three-fourths miles. There are over 225 miles of streets, more than sixty of which are paved. Grant Park is a beautiful place within the circle, and Piedmond Park is on the site of the Atlanta Exposition. The most prominent building in the city is the state capitol, which cost $1,000,000. Its exterior is of limestone, while the interior is decorated with Georgia marble.

The educational institutions include the Georgia Institute of Technology, Atlanta University, Clark University, Atlanta Baptist College, Morris Brown College, Gammon Theological Seminary, several medical, dental and business colleges and other schools. The city has a Carnegie library and a state library which contains law books and valuable documents on colonial history. The charitable institutions include Grady Hospital, Presbyterian Hospital, several sanitariums, a home for the friendless, a Florence Crittenden home and orphan asylums. Among the other prominent buildings are the Union passenger station, the courthouse, the city hall, the custom house, the chamber of commerce, a federal prison, two opera houses, a number of hotels and business blocks.

The city has excellent transportation facilities and conducts a large trade in cotton, tobacco, grain, horses and mules. The industrial establishments are rapidly increasing, and abundant water power is furnished by means of a dam across the Chattahoochee River. The principal manufactures include cotton goods, fertilizers, cotton-seed oil, foundry and machine shop products, engines, lumber, sheet metal work, terra cotta, brick, paints and other articles.

The first house was built on the site of Atlanta in 1836. The town was incorporated in 1843, under the name of Marthasville, and the present name was adopted two years later. The city was chartered in 1847, and at the outbreak of the Civil War had a population of about 11,000. During the war it was an important military point, and in 1864 was captured by the Federal army under Sherman. The city was nearly destroyed by fire on its evacuation by the Union forces, but after the war it was quickly rebuilt. In 1877 it was made the capital of the state, and in 1895 was the scene of the Cotton States and Atlanta Exposition. Population in 1910, 154,839, an increase of 49,839 since 1904.

Atlant′ic, Ia., the county-seat of Cass co., 82 mi. s. w. of Des Moines, on the Chicago, Rock Island & Pacific railroad. There are starch works, machine shops and other factories. It was incorporated in 1869. Population in 1905, 5180.

Atlantic Cable. See Cable, Atlantic.

Atlantic City, N. J., a city in Atlantic co., 60 mi. s. e. of Philadelphia, on divisions of the Pennsylvania and the Reading railroads. The city is a popular seaside resort and is built on Absecom Beach, a sandy island about ten miles long by three quarters of a mile wide, lying four to five miles from the mainland. The streets are broad and are named after the states in the Union, and a wide board walk four miles long forms the favorite promenade along the ocean. There are several miles of excellent bathing beach, while boating, fishing and hunting are also popular amusements. Nearly a hundred hotels and boarding houses accommodate the visitors, while Atlantic City Hospital, Mercer Memorial Home for Invalid Women and the Children's Seashore Home are prominent institutions. The existence of the city as a summer resort dates from about 1854, when the Camden & Atlantic railroad was completed. A fire in April, 1902, destroyed several hotels and a number of smaller structures, and thereafter all buildings erected within the city limits were required to be fireproof. Atlantic City is probably the most important all-the-year-round resort in the United States. Its climate and hotel accommodations are such that people visit the place even in the midst of winter. The census gave the population in 1910, as 46,150, while the transient population in summer is variously estimated from 250,000 to 300,000.

Atlantic Ocean, that division of the ocean lying between Europe and Africa on the east and north, and America on the west. Its northern and southern boundaries are not definitely fixed, but are generally considered to extend from the Arctic to the Antarctic Circle. This gives the Atlantic a length of 9000 miles. Its width varies from about 7000 miles, between Greenland and Norway, to 4100 miles, between Florida and the Strait of Gibraltar. The width, between Cape Palmas in Africa and Cape Saint Roque in South America, is 1900 miles. The area exclusive of branches is about 30,000,000 square miles. The important branches of the Atlantic are, on the east, the North Sea, the Baltic Sea, Bay of Biscay, Mediterranean and Gulf of Guinea, and on the west, Gulf of Mexico, Gulf of Saint Lawrence and Hudson Bay. Many geographers consider the Arctic Ocean merely as an extension of the Atlantic, while others consider it as a separate ocean. The coast line of the North Atlantic is irregular, but that of the South Atlantic is more even. The length of the eastern coast is over 32,000 miles; that of the western coast, 55,000 miles. The principal islands along the east coast are the Faroes, the British Isles, the Canaries, the Madeiras and Saint Helena. Those off the coast of America are Greenland, Newfoundland, the West Indies, Trinidad and the Falklands, while the Azores are just a little east and Iceland is just a little west of mid-ocean in the North Atlantic.

The bed of the Atlantic is divided, by a ridge extending north and south nearly midway between the continents, into two valleys, each of which is about 500 miles wide. The eastern varies in depth from 14,000 to 15,000 feet, and the western from 13,000 to 16,800. The dividing ridge is comparatively narrow and has a depth of from 9000 to 10,000 feet. North of the Azores the bed of the ocean gradually rises, forming a plateau whose length extends east and west from the Hebrides to Newfoundland. This is sometimes known as the telegraph plateau, because the Atlantic Cable is laid upon it (See Cable, Atlantic). This plateau separates the cold waters of the Arctic Ocean from the warmer waters of the Atlantic. The greatest depths of the North Atlantic have been found east of Newfoundland, where soundings have been obtained as low as 20,000 feet, and north of Porto Rico, where a depth of 27,000 feet has been reached. The South Atlantic has depths varying from 20,000 to 24 000 feet. For circulation, see Currents, Marine; Gulf Stream; also Tides; Waves.

Atlan′tis, an island which, according to Plato, existed in the Atlantic near the Pillars of Hercules (Straits of Gibraltar), was the home of a great nation and was finally swallowed up by the sea. The legend has been accepted by some as fundamentally true, but others have regarded it as the outgrowth of some early discovery of the New World.

At′las, in Greek mythology, a Titan whom Jupiter condemned to bear the vault of heaven. At his request Perseus showed him the head of Medusa, which had the property of turning all who looked at it to stone, and Atlas was changed into the mountains which bear his name. The name atlas is given to a collection of maps and charts, because in the first of these which appeared the figure of Atlas bearing the globe was given on the title-page.

Atlas Mountains, an extensive mountain svstem in North Africa, starting near Cape Nun on the Atlantic Ocean, traversing Morocco, Algiers and Tunis, and terminating on the coast of the Mediterranean. They are divided generally into two parallel ranges, running west to east, the Greater Atlas lying toward the Sahara, and the Lesser Atlas toward the Mediterranean. The principal chain is about 1500 miles long. Tizi-Tamjurt in Morocco is 14,500 feet high, and Miltsin in Morocco, 11,500 feet. Silver, antimony, lead, copper and iron are among the minerals. The vegetation is chiefly European in character, except on the low grounds and next to the desert. See Atlas.

Atmosphere, primarily the gaseous envelope which surrounds the earth; but the term is applied to that of any heavenly body. The atmosphere of the earth consists of a mass of gas extending to a height variously estimated at from 45 to 212 miles, and pressing on every part of the earth's surface with a pressure of about 15 pounds (14.7) to the square inch. The existence of this atmospheric pressure was first proved by Torricelli, who thus accounted for the rush of a liquid to fill a vacuum, and who, working out the idea, produced the first barometer. The average height of the mercurial column counterbalancing the atmospheric weight at the sea-level is a little less than 30 inches; but the pressure varies from hour to hour, and diminishes with the increase in altitude. The pressure varies daily and is usually lowest when the temperature is highest. The pressure upon the human body of average size is no less than 14 tons, but as it is exerted equally in all directions, as the gases in the body exert an equal pressure in an opposite direction, no inconvenience is caused by it. It is customary to take the atmospheric pressure as the standard for measuring other fluid pressures; thus, the steam pressure of 30 pounds per square inch on a boiler is spoken of as a pressure of two atmospheres.

The atmosphere consists of a mixture of oxygen and nitrogen in the almost constant proportion of 20 81 volumes of oxygen to 79.19 volumes of nitrogen, or by weight, 23.01 parts of oxygen to 76.99 of nitrogen. The gases are associated together, not as a chemical compound, but as a mechanical mixture. Upon the oxygen present depends the power of the atmosphere to support combustion and respiration; the nitrogen dilutes the oxygen and prevents its too energetic action. Besides these gases, the air contains aqueous vapor in variable quantity, ozone, carbonic acid gas, traces of ammonia, argon, and, in towns, sulphureted hydrogen and sulphurous acid gas. After thunder-storms, nitric acid is also observable. In addition to its gaseous constituents the atmosphere is charged with minute particles of vegetable, animal and mineral matter in the form of dust. See Air; Barometer; Wind.

At′mospher′ic Electricity, the electricity manifested by the atmosphere. See AURORA BOREALIS; LIGHTNING.

Atoll′, a coral reef surrounding a pool of shallow water, usually called a lagoon. The atoll is formed by the building of a coral reef on a circular or nearly circular foundation. It is usually broken in one or more places so that the lagoon is connected with the surrounding waters.

ATOLL

At′om. In chemistry an atom is the smallest particle into which matter can be divided. It is the subdivision of a molecule (See MOLECULE). For example, consider a molecule of water; it is composed of two parts of hydrogen and one part of oxygen. As long as the substance remains water it is formed from these elements united in this way; but if it be separated chemically, it becomes two atoms of hydrogen and one atom of oxygen. It cannot be subdivided further.

Atom′ic The′ory, a theory proposed by Dalton in the early part of the nineteenth century to explain chemical action. He believed that all matter is composed of very small particles, called atoms, which cannot be divided into anything smaller. He thought that these atoms, by uniting together, caused chemical changes.

There are several laws which have been laid down to govern chemical reaction. From one we learn that in any substance the elements forming it are always present in the same proportion by weight. From another law we find that when one element, like nitrogen, for example, unites with oxygen in several proportions by weight, the different proportions of oxygen are simple multiples of a common factor. A third law tells us that different elements which combine with a constant weight of one element combine in the same proportions with the constant weight of another element.

Atomic Weights. By carefully weighing numerous compounds, chemists have determined that there is a certain fixed ratio between the smallest amount of any element capable of existing in a compound and the weight of the same quantity of hydrogen existing under similar conditions This fixed number is called the atomic weight of the element. In other words, the atomic weight of any element is the number which shows how many times heavier than an atom of hydrogen is an atom of that element. If the atomic weight of hydrogen, then, is 1, of oxygen it is 16; of chlorine, 35.5; of gold, 197; of uranium, 239½. In the standard system recommended by a committee of German chemists, now generally in use, the basis is 16, the atomic weight of oxygen. See MOLECULES.

Atone′ment, as used commonly today, means that which is done to bring about a reconciliation between persons at variance; but the doctrine of atonement in theology considers what is necessary to bring man into union with God, from whom he has been separated by sin. It is on this point that Christianity differs from heathenism. Various ideas were held among the early church fathers concerning the manner in which the death of Christ was a sacrifice for our sins, a delivery from the power of Satan. Many early Christians asserted that God offered Christ to Satan. Anselm's interpretation, that Christ offered his life to God, for which God granted forgiveness of the sins of men, has been accepted by Protestants and Catholics, though different sects give various modifications to the doctrine.

A′trium, the entrance hall and central room of an old Roman house. This general room served as a living room in which the family ate and slept and in which were kept the Lares and Penates (See LARES AND PENATES). It had a roof which sloped downwards towards the center so that the rain water ran into a cistern in the floor beneath. As the houses increased in size, the style of the atrium changed, and under Augustus there was a series of columns forming a regular colonnade along the central opening. The houses of Pompeii furnish the best examples of atria which have been preserved. The term *atrium* is also applied to a large open court in front of a temple or public building, and also to the court in front of a basilical church, containing a fountain for ablutions, where penitents gathered to supplicate. This use of the atrium was discontinued in the early Middle Ages. See BAPTISTRY.

Atrophy, *at'ro fy,* a wasting of the flesh due to some interference in nutrition. It may arise from a variety of causes, such as organic disease, a want of proper food or of pure air or suppurations in important organs; it is also sometimes produced by poisons, such as arsenic, mercury and lead, in miners, painters, gilders and persons following similar occupations. In old age the whole frame except the heart undergoes atrophic change, and it is of frequent occurrence in infancy as a consequence of improper, unwholesome food and exposure to cold, damp or impure air. Single organs or parts of the body may be affected, irrespective of the general state of nutrition; thus, local atrophy may be caused by palsies, the pressure of tumors upon the nerves of the limbs or by artificial pressure, as in the feet of Chinese ladies.

At'ropos. See FATES.

Attach'ment, in law, the order of a court and the process by which an officer of the law seizes a certain person or property connected with an action at law. The writ of attachment against a person was formerly issued to bring a debtor before the court, but this use of the writ has been practically abandoned, and in the United States attachment against a person is issued only for contempt of court. The writ of attachment against property is commonly used to prevent the fraudulent removal or concealment of the goods before some question concerning it can be settled at law, or before a judgment against it can be satisfied.

Attain'der, the extinction of civil rights following upon a sentence of death or outlawry, in punishment for high crimes. In England common law attainder resulted in the forfeiture of all the victim's property, and it also produced corruption of blood, that is, it prohibited the attainted person from inheriting property or transmitting it to his heirs. These provisions were later modified by statute and the latter has been abolished. The United States Constitution contains the following provision: "No attainder of treason shall work corruption of blood or forfeiture, except during the life of the person attainted." Many state constitutions have similar provisions. See BILL OF ATTAINDER.

At'tar, in the East Indies, a general term for a perfume from flowers; in Europe, generally used only of the *attar* or *otto of roses,* an oil made from the leaves of several species of roses, 100,000 roses yielding only 180 grains of attar. Cashmere and Damascus are celebrated for its manufacture, and there are extensive rose farms in Rumelia and at Benares. The oil is at first greenish, but afterward it presents various tints of green, yellow and red. It is frequently adulterated with the oils of rhodium, sandalwood and geranium, with the addition of camphor or spermaceti. The attar is packed and exported in very slender glass bottles.

Atten'tion, the directing of the mind's energies to a definite purpose. Attention depends upon the condition of the brain and the attraction furnished by the object. It requires the expenditure of nerve force, and when the brain cells are unwearied less stimulus is necessary than when one is fatigued. This is illustrated by the activity of a child in the early part of the day. He is then interested in and gives his attention to many things which, when fatigued, he will scarcely notice. This law is also true of the adult. It requires greater effort to hold the attention upon a subject when one is tired, and for this reason strenuous mental work is usually accomplished with less effort in the early part of the day.

Attention is of two kinds, *non-voluntary* and *voluntary.* The non-voluntary is without effort or fixed purpose, while the voluntary is directed by the will towards a definite purpose. Non-voluntary attention is characteristic of early childhood, and its activity is aroused by external objects. It is transitory and without motive, but it merges into voluntary attention so quickly that the two phases are not always distinguishable, and what is frequently termed non-voluntary is voluntary attention. Just as soon as an object which excites non-voluntary attention is sought for a purpose, the attention upon it becomes voluntary, as in the case of a child having his attention arrested by a flower; no sooner does he see it than he desires to possess it. His non-voluntary attention has then become voluntary. But before he has obtained the flower, some other object having a stronger attraction may secure his attention, and he will leave the flower and follow the new object. Because of these changes we often consider the child's attention to be wholly of the non-voluntary sort. This, however, is due to his apparent lack of purpose.

Voluntary attention is under control of the will and is roused through interest in an object more or less remote, the attainment of which requires effort. A pupil's attention is not drawn to a problem in arithmetic so much by the problem itself as by the ability which its solution will give him. A boy climbs to the top of a toboggan slide, not for the purpose of reaching the highest point, but because he wishes to slide down, and getting to the top is a necessary step toward the desired end. Interest is the foundation of voluntary attention, and the mind never gives heed to those things which have no significance. Objects of interest include impressions from the external world received through the senses, and those arising from the operations of the mind itself, such as memory and imagination. The external impressions form by far the larger class. The amount of effort necessary to fix the attention upon an object depends upon our interest in the object and our condition of mind. Strong stimuli, such as those produced by the ringing of a bell or the firing of a gun, call for but little effort, but their effect is usually transitory. Those subjects in which we are deeply interested call for but little effort, while those concerning which we know but little or in which we feel only a slight interest, require great effort to enable us to hold our attention upon them. However, as we learn more of a subject our interest in it usually increases, and the effort necessary to hold attention upon it becomes less and less, until we are frequently absorbed in the subject. Complete absorption is the highest degree of attention and is reached only in cases of the most intense mental activity. In such a state one may be spoken to and not hear, may fail to notice the presence of others, or may even receive bodily injury without being aware of it at the time.

Attention is the foundation of all knowledge, and its development and training are essential to a well-disciplined mind. These are in accordance with certain principles and laws which should be understood by the parent and teacher:

(1) Attention grows with the development of the nervous system. In the young child it is almost wholly involuntary, while in the educated adult it is almost wholly voluntary. The first work of the parent and teacher is to change the non-voluntary to voluntary attention.

(2) Attention is a selective activity. Whatever ideas are in our minds are there because at some time in life we willed to put them there. Attention singles out or abstracts one object from among many crowding upon the mind, and directs our activity to it. It also suppresses other objects so as to make the principal object of our desires stand out clearly in consciousness. Since the child is unable to make fine distinctions, he can hold in consciousness only the larger features and relations of objects, such as form, color and odor, while the trained intellect is able to make finer distinctions.

(3) Attention can be fixed only upon those objects and ideas which have some meaning, that is, which point to something beyond themselves. Therefore, in training the attention of children, those subjects which have significance in the child's life should be used. Each lesson should bring out something new, but this should be so related to the knowledge already in the mind that it can be readily understood. The effort of attention is lessened in proportion as the interest is increased.

(4) Attention can be held for only a short time on an object that does not change; hence, the teacher should so plan her lessons as to give such variety as will hold the attention of her pupils, and at the same time return again and again to the leading idea, until it is comprehended.

(5) Attention requires effort and is followed by fatigue. For this reason lessons for young children should be short, seldom exceeding ten minutes, and if the activity required is intense the time should be shorter. Each period of intense activity should be followed by a period of relaxation, when the children engage in play or are provided with an entirely different occupation.

(6) Attention becomes habitual. It is therefore important that this power be rightly trained during childhood and youth. Because of inability to hold their attention upon a subject for any length of time, many people fail to accomplish difficult tasks.

See Association of Ideas; Habit; Interest; Perception. Consul Hughes's *The Art of Securing Attention* and Compayre's *Lectures on Pedagogy*, Chapter V.

At'tic, an architectural term used to designate a low story surmounting the entablature or main cornice of a building. It also refers to a low story at the top of a building and to the sky-lighted rooms in the roof. An *attic base* is a peculiar kind of base consisting of an upper and lower torus separated by a scotia and resting on a square plinth, and was used by the ancient architects in the Ionic order and by Palladio and some others in the Doric.

At'tica, the triangular peninsula that forms the southeastern extremity of Greece. The soil is poor and the water supply scanty, and these facts, combined with the character of the coast and an exceptionally fine harbor, turn many of the inhabitants to a seafaring life. Athens, the capital of Attica, was the most famous city of ancient Greece. See ATHENS; GREECE, subhead *History*.

At'tila, the famous leader of the Huns, succeeded, with his brother Bleda, to the domain of his uncle Roas in 434 A. D. The rule of the two leaders extended over a great part of northern Asia and Europe, and they threatened the Eastern Empire and twice compelled the weak Theodosius II to purchase peace. Attila had his brother murdered about 445, and in a short time greatly extended his dominions. Thrace, Macedon and Illyria were overrun, and then Attila turned his attention to the West. He met the allied armies of the emperor and the Visigothic king, Theodoric, at Chalons, and was defeated after a bloody battle. In 452 he entered Italy, but was prevented from attacking Rome by Pope Leo I. Attila died on the night of his marriage with Hilda (or Ildico), either from the bursting of a blood vessel or by her hand. The description of Attila which has come down to us states that he had a large head a flat nose, broad shoulders and a short and ill-formed body, but that his eyes were brilliant, his walk stately and his voice strong and well-toned.

At'tlebo'ro, MASS., a town in Bristol co., 31 mi. s. w. of Boston, on the New York, New Haven & Hartford railroad. It contains dye houses, gold and silver refineries and smelters, and extensive manufactures of jewelry, silverware, cotton goods, machinery, carriages and various other articles. The municipality has a public library, an almshouse and a sanitarium, and it owns and operates the waterworks. It was settled in 1669 and was incorporated as a separate town in 1694. Population in 1910, 16,215.

Auber, *o bare'*, DANIEL FRANCOIS ESPRIT (1782–1871), a French operatic composer, who was originally educated for a mercantile career. More than forty operas testify to his incessant labor and power of originality. Of these, the best are *Masaniello* (1828) and *Fra Diavolo* (1830).

Au'burn, ME., the county-seat of Androscoggin co., 30 mi. s. w. of Augusta, on the Androscoggin River and on the Maine Central and Grand Trunk railroads. Water power is supplied by the river for the manufacturing of cotton goods, boots and shoes, furniture and leather. Lewiston Falls, Lake Auburn and Poland Springs are scenic points of interest. The place was settled in 1786. Population in 1910, 15,064.

Auburn, N. Y., the county-seat of Cayuga co., 174 mi. w. of Albany, on Owasco Lake and on the New York Central and the Lehigh Valley railroads. The lakes provide good water power and the manufactures include cotton and woolen goods, carpets and agricultural implements. The city has many fine buildings and is the seat of Auburn Theological Seminary. Another feature of interest is the bronze statue of William H. Seward, whose home was here. Auburn is the seat of a large state prison known for its *silent* system of discipline, where the inmates work together without talking to one another, and when not at work are confined in separate rooms. A state insane asylum and an armory are also located in Auburn. The place was first settled by Capt. John L. Hardenburgh in 1792 and was known as Hardenburgh's Corners. It was made the county-seat in 1805 and was then given its present name, from the place described by Oliver Goldsmith in his *Deserted Village*. Population in 1910, 34,668.

Auck'land, a town and former capital of New Zealand, situated on Waitemata Harbor, one of the finest harbors of New Zealand. It has a college, some fine public buildings, two libraries and a botanical garden. The trade is considerable, connection with the chief places on the island being furnished by railroad and with the other ports of the colony, Australia and Fiji by steamboat. The chief industries are shipbuilding, sugar refineries, glass-works and sawmills. Population in 1901, 34,216.

Auc'tion, the public sale of an article to the party offering the highest price, or to the bidder who first accepts the terms offered by the vender where he sells by reducing his terms until some one accepts them. The latter form is known as a *Dutch auction.* A sale by auction must be conducted in the most open and public manner possible; and there must be no collusion on the part of the buyers. Puffing or mock bidding to raise the price by apparent competition is illegal. A bid is an offer and when accepted forms a binding contract (See CONTRACT).

Audiphone, *aw'de fone,* or **Dentiphone,** an instrument by means of which deaf persons are enabled to hear. It consists essentially of a fan-shaped plate of hardened rubber, having a handle at one end and a string attached to the opposite end. The plate is bent downward by pulling on the string, thus forming a concave surface which collects the sound waves and transmits them to the teeth, from which they are conveyed to the auditory nerve through the bones of the face. The audiphone is of use to people whose deafness is caused by defects in the external or middle ear. See Ear.

Aud′ubon, John James (1780–1851), an American naturalist, born at Mandeville, Louisiana, of French parentage. He was educated in France, and studied painting under David. In 1798 he settled in Pennsylvania, where he lived for ten years, devoting his time to the study of birds and to making drawings in natural history. In 1826 he went to England, exhibited his drawings in Liverpool, Manchester and Edinburgh, and finally published them in an unrivaled work, containing four hundred thirty-five colored plates of birds the size of life, entitled *The Birds of America.* Later there appeared an accompanying text entitled *Ornithological Biography*, partly written by William Macgillivray. On his return to America Audubon labored with Dr. Bachman on a finely illustrated work entitled *The Quadrupeds of America.* His great merit is the accuracy and extent of his original observations. The *Audubon Society*, for the protection of American birds, is named for him.

Audubon Society, The, an organization which has for its objects the disseminating of information about our common birds, in order to prevent their destruction, and the creating of a sentiment against the wearing of birds and feathers as articles of adornment. There are Audubon Societies in thirty states, with sixty thousand members. Hundreds of thousands of circulars have been issued. All the New England states, New York, New Jersey, Delaware, Florida Ohio, Kentucky, Indiana, Illinois, Wisconsin, Arkansas and Wyoming, have adopted the bird law of the American Ornithological Union, which forbids the killing at any time of non-game birds. *Bird Lore*, a bi-monthly magazine, is the official organ of the society.

Auerbach, *ow′ur bahK*, Berthold (1812–1882), a distinguished German author of Jewish extraction. He abandoned the study of Jewish theology in favor of philosophy and devoted himself to the study of Spinoza, whose works he translated. Among his chief works are *Judaism and Modern Literature; Village Tales of the Black Forest*, the widest known of his writings; *Edelweiss*, and *On the Heights.*

Augeas, *aw′je as*, a mythical king of Elis, in Greece, whose stable contained 3,000 oxen and had not been cleaned for thirty years. Hercules undertook to clear away the filth in one day in return for a tenth part of the cattle, and executed the task by turning the river Alpheus through the stable. Augeas, having broken the bargain, was deposed and slain by Hercules.

Au′ger, a tool used for boring wood. The auger has a screw at the point, for drawing it into the wood, and a spiral pod with a cutting lip at each side of the end next to the screw. The upper end of the pod forms the shank to which the handle is attached. Large augers have handles fastened to them, but smaller ones, usually called bits, have a common shank which fits into a brace or bit-stock. See Boring Machines.

AUGER

Augite, *aw′jite*, or **Pyroxene,** a mineral of the hornblende family, an essential component of many igneous rocks, such as basalt, greenstone and porphyry. A transparent green variety found at Zillerthal, in the Tyrol, is used in jewelry.

Augsburg, *owgs′boorg*, a city of Bavaria, a renowned commercial center in the Middle Ages, and still an important emporium of south German and Italian trade. There are many beautiful churches, some of which date from medieval times, among them being the cathedral and the memorial chapel of the Fugger family. Other important buildings are the town-hall, which contains the celebrated Golden Hall, one of the finest halls in Germany, and the former episcopal palace, in which, in 1530, the Augsburg Confession was presented to the emperor, Charles V. Besides these there are several beautiful modern buildings, a theater, a library and a splendid gallery of paintings. The chief industries are cotton spinning and weaving, dyeing, woolen manufacture, book printing and binding and manufactures of machinery, metal goods and chemicals. Augsburg is a place of great antiquity, Emperor Augustus having established a colony here about 12 B.C. In 1276 it became a free city, and, besides being a great mart for the commerce between the north and south of Europe, it was a great center of German art in the Middle Ages. It early took a conspicuous part in the Reformation. In 1806 it was incorporated in Bavaria. Population in 1900, 88,700.

Augsburg Confession. The emperor Charles V, with the aim of arranging the difficulties between the Catholic and Protestant parties in Germany which were the result of the Reformation, called a diet in 1530 and requested the Protestants at that time to present a statement of their beliefs. Luther was under the ban of the Empire and could not attend the diet, and the confession was therefore drawn up by Melanchthon and revised by Luther before being read. Charles V and the Catholics would not accept the document, and the two divisions of the Church soon separated completely. From that time the Augsburg Confession has been regarded as the expression of the creed of the Lutheran Church.

Au'gurs, a board or college of diviners who, among the Romans, predicted future events and announced the will of the gods. Their predictions were determined by signs in the sky, especially thunder and lightning; by the flight and cries of birds; by the feeding of the sacred chickens; by the course taken or sounds uttered by various quadrupeds or by serpents; by accidents or occurrences, such as spilling the salt or sneezing. The answers of the augurs, as well as the signs by which they were governed, were called auguries, but bird-predictions were properly termed auspices. Nothing of consequence could be undertaken without consulting the augurs, and by the mere utterance of the words *alio die* (on another day) they could dissolve the assembly of the people and annul all decrees passed at the meeting.

Au'gust, the eighth month from January. It was the sixth of the Roman year, and hence was called *Sextilis* till the Roman Senate renamed it in honor of Augustus.

Augus'ta, Ga., the county-seat of Richmond co., on the Savannah River, at the head of navigation, 303 mi. from its mouth. The Southern and other railroads connect with the city. The water supply is under municipal operation. It comes through a canal from a dam in the river 9 miles above the city, and also yields some 14,000 horse-power for manufactures. The mild, even temperature and dry air are causing the place to become increasingly popular as a health resort. Augusta is one of the largest cotton markets in the South and has iron foundries, wood working industries and important manufactories of cotton goods. It also ships a considerable amount of lumber, fruits and vegetables. The Georgia Medical College, which is a part of the state university, and Richmond, Saint Mary's and Sacred Heart academies, and Paine's Institute for Colored Students are located here. The streets of the city are broad and shady, and there are several parks and twenty-five public squares. The most important buildings are the Masonic Temple, Odd Fellows' Hall and the Cotton Exchange. Population in 1910, 41,040.

Augusta, Me., the capital of the state and the county seat of Kennebec co., 63 mi. n. e. of Portland, on the Maine Central railroad and on the Kennebec River, 45 mi. from its mouth. The river furnishes water power for manufactures of cotton goods, paper, wood pulp and lumber. The state house, city hall, post office, asylum and United States arsenal are important buildings. In the state house is the state library of 60,000 volumes and a notable collection of portraits of distinguished Americans. Four miles from the city is a National Soldiers' Home. The first settlement, known as Cushnoc, was made by traders in 1754, and the town was incorporated as Hallowell in 1771, but the name was soon changed to Augusta. It became the capital of the state in 1831. Population in 1910, 13,211.

Augustine, *aw'gus tine*, or **Aus'tin,** Saint, the *Apostle of the English*, flourished at the close of the sixth century. He was sent with forty monks by Pope Gregory I to introduce Christianity into Saxon England, and was kindly received by Ethelbert, king of Kent, whom he converted, baptizing 10,000 of his subjects in one day in the river Swale.

Augustine, Aurelius Augustinus, Saint (354–430), a renowned father of the Christian Church. He was sent to Carthage to be educated and there entered into the vices and gay life of the time. In 383 he went to Rome and thence to Milan, where he came under the influence of Saint Ambrose and was converted to Christianity. He divided his goods among the poor, retired to private life and gained a reputation by his writings. He was a man of great enthusiasm, powerful intellect and strong influence, and his *Confessions* form a remarkably written autobiography. It is said "he moulded the spirit of the Christian Church for centuries," and both Protestants and Catholics appealed, during the Reformation, to his authority.

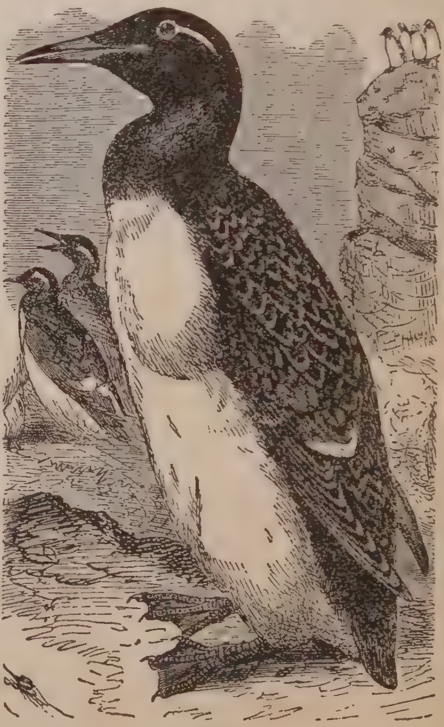
Augus'tus I, Frederick (Augustus II of Poland, 1670–1733), elector of Saxony and king of Poland. He succeeded his brother in the electorate in 1694, and when the Polish throne became vacant, by the death of John Sobieski, Augustus secured it. He joined with Peter the Great in the war against Charles XII of Sweden. In 1704 he was deposed, but after the defeat of Charles at Pultava, the Poles recalled him. The death of Charles XII put an end to the war, and Augustus concluded a peace with Sweden.

Augustus II, FREDERICK (Augustus III of Poland, 1696–1763), elector of Saxony and king of Poland, son of Augustus I, succeeded his father as elector in 1733 and was chosen king of Poland through the influence of Austria and Russia.

Augustus, CAIUS JULIUS CAESAR OCTAVIANUS (63 B. C.–14 A. D.), originally called Caius Octavius, Roman emperor, was the son of Caius Octavius and Atia, a daughter of Julia, the sister of Julius Caesar. After Caesar's death Octavius returned to Rome to claim Caesar's property and avenge his death, and now took, according to usage, his uncle's name with the surname Octavianus. After a struggle with Antony, in which Antony was overcome, Octavianus succeeded in getting himself chosen consul, and soon afterwards, having effected a reconciliation with Antony, he formed, with him and Lepidus, the second triumvirate. This alliance resulted in a proscription, in which three hundred senators and two thousand knights were put to death.

Next year Octavianus and Antony defeated the republican army under Brutus and Cassius at Philippi, and the victors now divided the Roman world between them, Octavianus taking the West, Antony the East and Lepidus Africa. Sextus Pompeius, who had made himself formidable at sea, was now put down; and soon after, Lepidus, who had hitherto retained an appearance of power, was deprived of all authority and retired into private life. Antony and Octavianus now shared the Empire between them; but while the former, in the East, gave himself up to a life of luxury and alienated the Romans by his alliance with Cleopatra and his adoption of Oriental manners, Octavianus skillfully cultivated popularity and soon declared war against the queen of Egypt The naval victory of Actium, in which the fleet of Antony and Cleopatra was defeated, made Octavianus master of the world, 31 B. C. He returned to Rome, celebrated a splendid triumph and caused the temple of Janus to be closed as a sign of universal peace. Gradually all the highest offices of state, civil and religious, were united in his hands, and the new title of *Augustus* (sacred) was formally conferred by the senate in 27 B. C. Under him successful wars were carried on in Africa and Asia, in Gaul and Spain, in Pannonia and in Dalmatia; but the defeat of Varus by the Germans under Arminius, with the loss of three legions, 9 A. D., was a great blow to him. He adorned Rome in such a manner that it was said, "He found it of brick, and left it of marble." The people erected altars to him, and by a decree of the senate, the month Sextilis was called *Augustus.* His death, which took place at Nola, plunged the Empire into the greatest grief. Augustus was thrice married, but had no son, and was succeeded by his stepson, Tiberius, whose mother, Livia, he had married after prevailing on her husband to divorce her.

Auk, a general name for certain swimming birds common in the polar regions. There are but two species of the auks proper, the great auk and the razor-bill. The great auk, a bird about three feet in length, was formerly plentiful in the northern regions and was known to visit the British Isles, but within the knowledge of man it has become extinct. In museums, however, there are some seventy skins, a number of eggs and the skeletons of still more individuals. The wings of the great auk were only about six inches



AUK

in length and totally useless for flight, but were employed vigorously as fins in swimming, especially while the bird was diving. The tail was about three inches long and the legs of the bird were placed so far back that when on land the bird seemed to stand erect. The head, neck and upper parts of the bird were black, but a large spot under each eye and most of the under parts were white.

The razor-bill is about fifteen inches in length and can use its wings in flight. Thousands of these birds are killed on the coast of Labrador for their breast feathers, which are thick and warm. Among the species grouped with the auks are the tufted puffin and the rhinoceros auklet of the North Pacific, the black guillemot of the North Atlantic, the murre or common guillemot, which migrates from Spitzbergen southward to the New England states, and the little auk of Greenland and northern Iceland. These birds spend the winter in the open seas, but in spring they come to land, where each pair claims its little space of ground on which is laid its single egg. There are localities on the northeastern coast of North America where thousands of these birds, sometimes representatives of several different species, may be seen sitting close together, each protecting its own egg, which it holds upon its webbed feet and covers with its body.

Au'lis, in ancient Greece, a seaport in Boeotia, on the strait called Euripus, between Boeotia and Euboea. It was at Aulis that the Greeks were supposed to have gathered before setting out for Troy.

Aure'lian, Lucius Domitius Aurelianus (about 212–275), emperor of Rome. He was of humble origin, rose to the highest rank in the army and on the death of Claudius II in 270 was chosen emperor. He delivered Italy from the barbarians, conquered the famous Zenobia, queen of Palmyra, and followed up his victories by the reformation of abuses and the restoration throughout the Empire of order and regularity. He was assassinated while heading an expedition against the Persians.

Aure'lius, Marcus (surnamed *Antoninus*) (121–180 A. D.), often called simply Marcus Aurelius, a Roman emperor and philosopher, the adopted son and successor of Antoninus Pius. He succeeded to the throne in 161. Brought up and instructed by Plutarch's nephew, Sextus, the orator Herodes Atticus and the jurist L. Volusius Mecianus, he had become acquainted with learned men and had formed a great love for the Stoic philosophy. A war with Parthia broke out in the year of his accession and did not terminate till 166. On his return from this struggle he was obliged to turn his attention to the German tribes who were menacing the Roman state. His brother Verus had died, and the sole command of the war devolved on Marcus Aurelius, who prosecuted it with the utmost vigor, compelling the Marcomanni and other tribes to sue for peace. The sedition of the Syrian governor Avidius Cassius, with whom Faustina. the empress, was in treasonable communication, called the emperor from his conquests, but before he reached Asia the rebel was assassinated. Aurelius returned to Rome, after visiting Egypt and Greece, but soon new incursions of the Marcomanni compelled him once more to take the field. He defeated the enemy several times, but his activities had exhausted him and he died in the midst of his wars. His only extant work is the *Meditations*, which has been translated into most modern languages, and which contains many beautiful passages that are everywhere familiar. Aurelius was one of the best emperors Rome had, although his philosophy and the magnanimity of his character did not restrain him from the persecution of the Christians, whose religious doctrines he was led to believe were subversive of good government.

AURORA
With heralds and sun-god.

Aurochs, *aw'roks*. See Bison.

Auro'ra, in classical mythology, the goddess of the dawn, daughter of Hyperion and Thia, and sister of Helios and Selene (Sun and Moon). She was represented as a charming figure, "rosy-fingered," clad in a yellow robe, rising at dawn from the ocean and driving her chariot through the heavens. Among the mortals whose beauty captivated the goddess, poets mention Orion, Tithonus and Cephalus.

Aurora, Ill., a city in Kane co., 38 mi. w. of Chicago, on the Fox River and on the Chicago & Northwestern, the Chicago, Burlington & Quincy and the Illinois Central railroads. It has a fine city hall, iron bridges, a Young Men's Christian Association building, a state hospital, a Carnegie library and twelve churches. The public school system is excellent, and Aurora is also the seat of Jennings Seminary and other schools. Aurora is important as a manufacturing center, and among the establishments here are railroad repair shops, cotton and woolen mills, foundries, flour mills, stove works, corset factories and carriage factories. The surrounding country is agricultural, with a gently rolling surface. The first settlement was known as McCarty's Mills, but the present name was adopted in 1837. Aurora became a city in 1857. Population in 1910, 29,807.

Aurora, Mo., a city in Lawrence co., 270 mi. s. w. of Saint Louis, on the Saint Louis & San Francisco and the Kansas City, Fort Scott & Memphis railroads. It is in an agricultural and fruit growing region. The city has lead and zinc mines and foundries, machine shops and flour mills. Population in 1900, 6191.

Auro'ra Bo'rea'lis or **Northern Lights,** the name of a peculiar light seen in the sky at night, usually in the northern portion of the heavens. A similar light in the southern hemisphere is called the *Aurora Australis.* The northern aurora has been far the most observed and studied. It usually manifests itself by streams of light ascending toward the zenith from a dusky line of cloud or haze a few degrees above the horizon and stretching from the north toward the west and east, so as to form an arc with its ends on the horizon. Its different parts and rays are constantly in motion. Sometimes it appears in detached places; at other times it almost covers the sky. It assumes many shapes and a variety of colors, from a pale red or yellow to a deep red or blood color; and in the northern latitudes serves to illuminate the earth and cheer the gloom of the long winter nights. When electricity passes through rarefied air it exhibits a diffused luminous stream which has all the characteristic appearances of the aurora, and hence it is highly probable that this light is occasioned by the passage of electricity through the upper regions of the atmosphere. The connection between the aurora and magnetism is also evident from the fact that the magnetic needle is strongly affected by it. See Electricity; Magnetism.

Au'rungzebe' (1619?–1707), one of the great Mogul emperors of India. In his twentieth year he raised a body of troops and obtained the government of the Deccan. He murdered his relatives, one after another, and in 1659 ascended the throne. Two of his sons, who endeavored to form a party in their own favor, he caused to be arrested and put to death by slow poison. He conquered Golconda and Bejapur and drove out, by degress, the Mahrattas from their country. After his death the Mogul Empire declined.

Ausable Chasm, a picturesque gorge on the Ausable River, 2 miles from Keeseville, Clinton co., N. Y. The gorge is about two miles long and in some places 175 feet deep. The walls are vertical and in many places show faults in the strata of rock, which is hard sandstone.

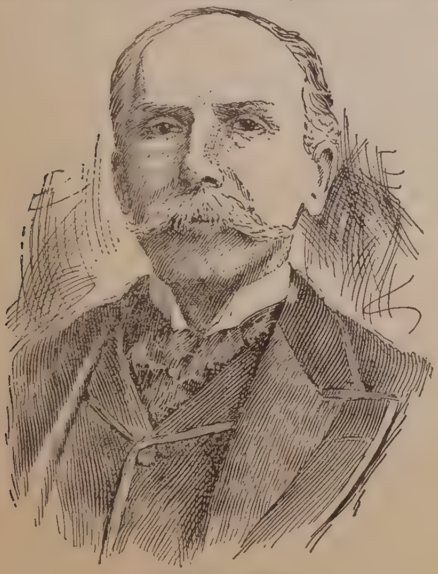
Aus'ten, Jane (1775–1817), an English novelist whose works give a remarkably clear picture of the manners and standards of her day. Her novels, *Sense and Sensibility, Pride and Prejudice, Mansfield Park, Emma, Northanger Abbey* and *Persuasion,* absolutely free from sensationalism in style and plot and giving unadorned pictures of the lives of the middle classes, are always interesting.

Austerlitz, *ows'tur litz,* a town in Moravia, 10 mi. e. of Brunn, famous for the battle in 1805, in which Napoleon with 70,000 men defeated the allied Austrian and Russian armies with 95,000 men. The decisive victory of the French led to the Peace of Pressburg between France and Austria. Population in 1900, 3703.

Aus'tin, Minn., the county-seat of Mower co., 100 mi. s. of St. Paul, on the Red Cedar River and on the Chicago Great Western and the Chicago, Milwaukee & St. Paul railroads It is surrounded by fertile prairie land, which produces live stock, dairy products and grains. The city has good water power and its industries include meat packing establishments, flour mills, railroad shops, cement works and creameries. The Southern Minnesota Normal College is located here. The city has Lafayette Park and numerous fine public buildings, including the Carnegie Library and Saint Augustine's Church. Austin was settled in 1854 and was chartered as a city in 1873. It now owns its waterworks and electric lighting plant. Population in 1910, 6960.

Austin, Tex., the capital of the state and the county-seat of Travis co., 160 mi. n. w. of Houston, on the Houston & Texas Central, Missouri, Kansas & Texas, International & Great Northern and other railroads. The city is beautifully located 40 feet above the north bank of the Colorado River, which is spanned here by two bridges. In 1893 an immense dam 1275 feet long was built, but it was carried away by a flood in 1900. The most prominent building is the state capitol, constructed of red granite at a cost of $3,500,000. Austin is the seat of the state university, Saint Edward's College, Tillotson Institute for Colored Students and a number of other important schools. State asylums for the insane, the blind and the deaf and dumb, and the Confederate Soldiers' Home are also located here. There is an extensive wholesale trade in provisions, groceries and dry goods, and the place is an important market for live stock, cotton, grain and hides. There are important manufactories of flour, lumber, iron and leather goods. Austin was originally known as Waterloo, but in 1837 it received its present name, was made the capital of the Republic of Texas in 1839 and later the permanent capital of the state. Population in 1910, 29,860.

Austin, Alfred (1835–), an English poet, born near Leeds. After graduating at the University of London, he was called to the bar, but soon gave up the law for literature. In 1896 he was made poet laureate of England. Among his poetical works are *English Lyrics*, *Songs of England* and *A Tale of True Love and Other Poems*, dedicated to Theodore Roosevelt. His critical notes in the *National Review* are interesting, and his essay, *The Poetry of the Period*, has attracted much attention.



ALFRED AUSTIN

Austin, Stephen Fuller (1793–1836), a Texas pioneer and founder of the city of Austin. He led a company of colonists to Texas in 1821 and settled on a tract of land granted to his father in 1820. In 1833 he was delegate to Mexico to obtain ratification of the Texan constitution, and in 1835 he was made commander of the Texan revolutionists and went to Washington to secure the recognition of the independence of the Texan republic. He died soon after his return to Texas.

Australasia, *aws tral a'she ah.* See Oceania.

Austra'lia, the smallest of the continents, lies between the Indian and the Pacific oceans, to the southeast of Asia and between 10° 41′ and 39° 11′ south latitude and 113° and 153° 40′ east longitude. In form it is an irregular oval. The greatest length from east to west is 2500 miles, and from north to south, about 2000 miles. The area, including Tasmania and smaller islands, is 2,973,000 square miles. Australia is much smaller than the other grand divisions, and by some geographies it is designated as an island. It is surrounded by the Pacific Ocean on the east, the Indian Ocean on the south and west, and Timor Sea, Arafusa Sea and Coral Sea on the north, all comparatively small passages of water separating the continent from the chain of islands to the north. The coast lines are quite regular. On the north there are two noticeable indentations, Queen's Channel and the Gulf of Carpentaria, while the Great Australian Bight touches most of the southern coast. The surrounding islands politically connected with Australia are New Zealand and Tasmania, a large group at the north belonging geographically to Asia. It is supposed by many that this chain of islands constitutes the remains of a connecting belt of land which in a past geological age joined Australia to the Asiatic continent.

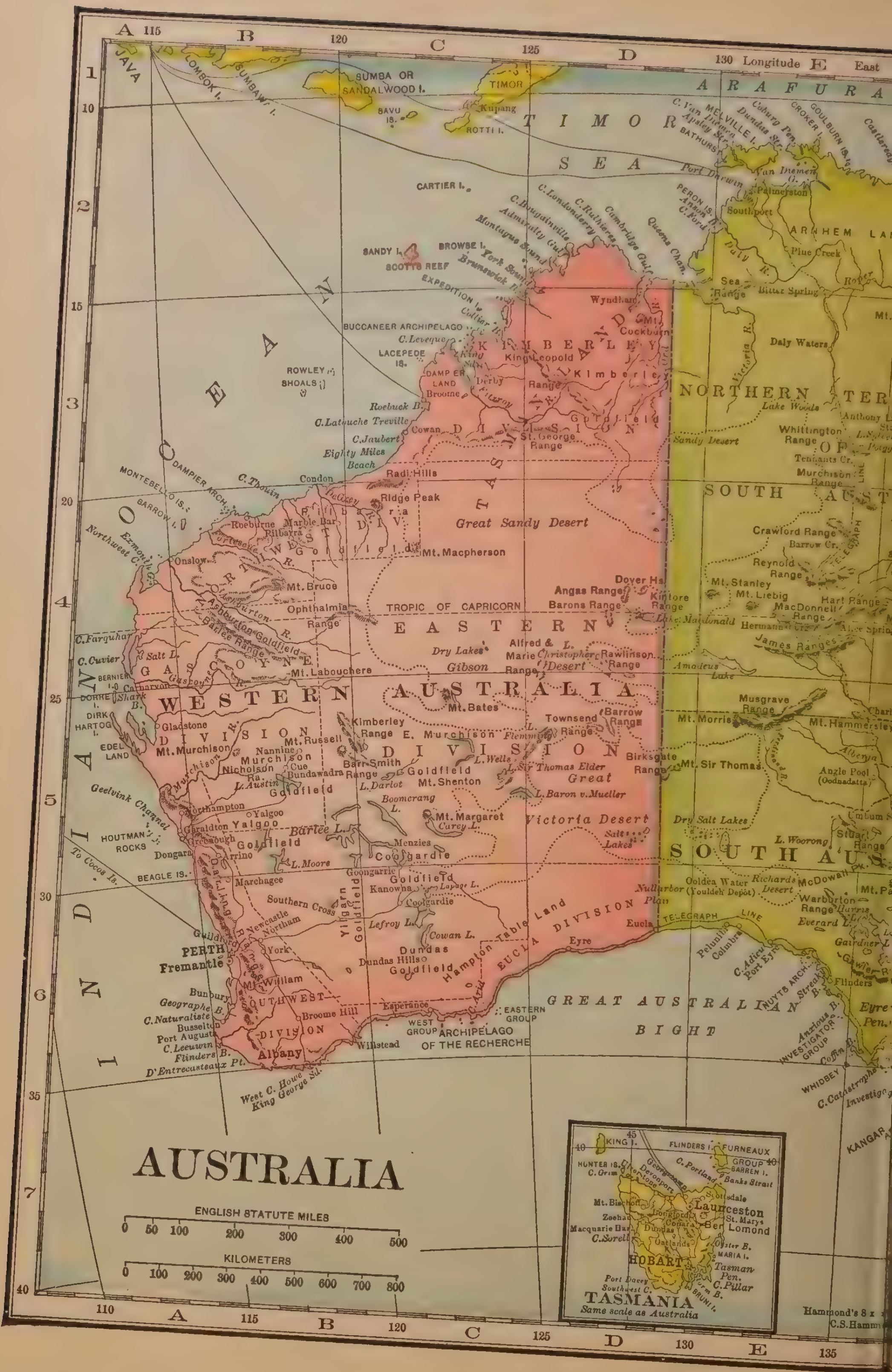
Surface and Drainage. The relief forms of Australia are much simpler than those of other continents. The elevation consists of a chain of highlands known as the Great Dividing Range, which begins near the western boundary of Victoria and extends nearly parallel to the coast as far as Cape York. These mountains are highest at their southern extremity, where Mount Kosciusko, the highest peak, reaches an elevation of 7175 feet, and two others exceed 7000 feet. This mountain system is given various local names, such as the Australian Alps, in Victoria, the New England Range and Liverpool Range. It is distant from the coast from 50 to 300 miles, and forms the watershed which separates the rivers flowing into the Pacific from those flowing into the interior and into the Indian Ocean. The center of the continent is a vast low plain, which rises gradually toward the north and west. In some places this is traversed by low ranges of hills that divide it into smaller plateaus of varying elevations. To the west of this plain and skirting the western coast are irregular ranges of low mountains. The northern and southern coasts are nearly all low land.

The rivers are few and the river systems are very small. The most important of these is the Murray, with its tributaries, the Darling, Lachlan and Murrumbidgee. This system drains a great part of the interior west of the Dividing Range and enters the sea on the south coast. To the east of the Dividing Range the important streams are the Hunter, Clarence, Brisbane, Fitzroy and Burdekin. The Gilbert, Norman and Flinders are the principal streams flowing into the Gulf of Carpentaria, and on the western coast the Murchison, Gascoyne, Ashburton and Fitzroy flow into the Indian Ocean. In the interior is a number of streams which flow into salt lakes or evaporate in the sands. The most important of these is Cooper's Creek. The others are all small. There are several lakes in the interior, all of which are on the south side of the continent. They have no outlets and consequently are salt. The most important of these are lakes Eyre, Torrens, Gairdner and Amadeus.

Mineral Resources. The most important mineral yet discovered is gold, and for more than fifty years the output of gold from Australia has been among the largest of all countries. The gold district is along the eastern part of the continent and is almost entirely confined to the region traversed by the mountains. However, since 1890 some valuable mines have been opened near the western coast. There are also valuable deposits of coal and iron ore, as well as mines of silver and copper which yield a profitable income. Antimony, bismuth, manganese, platinum and lead are also found. Diamonds and other precious stones occur in some localities, and building stones of good quality, together with clays suitable for brick and tile, are abundant.

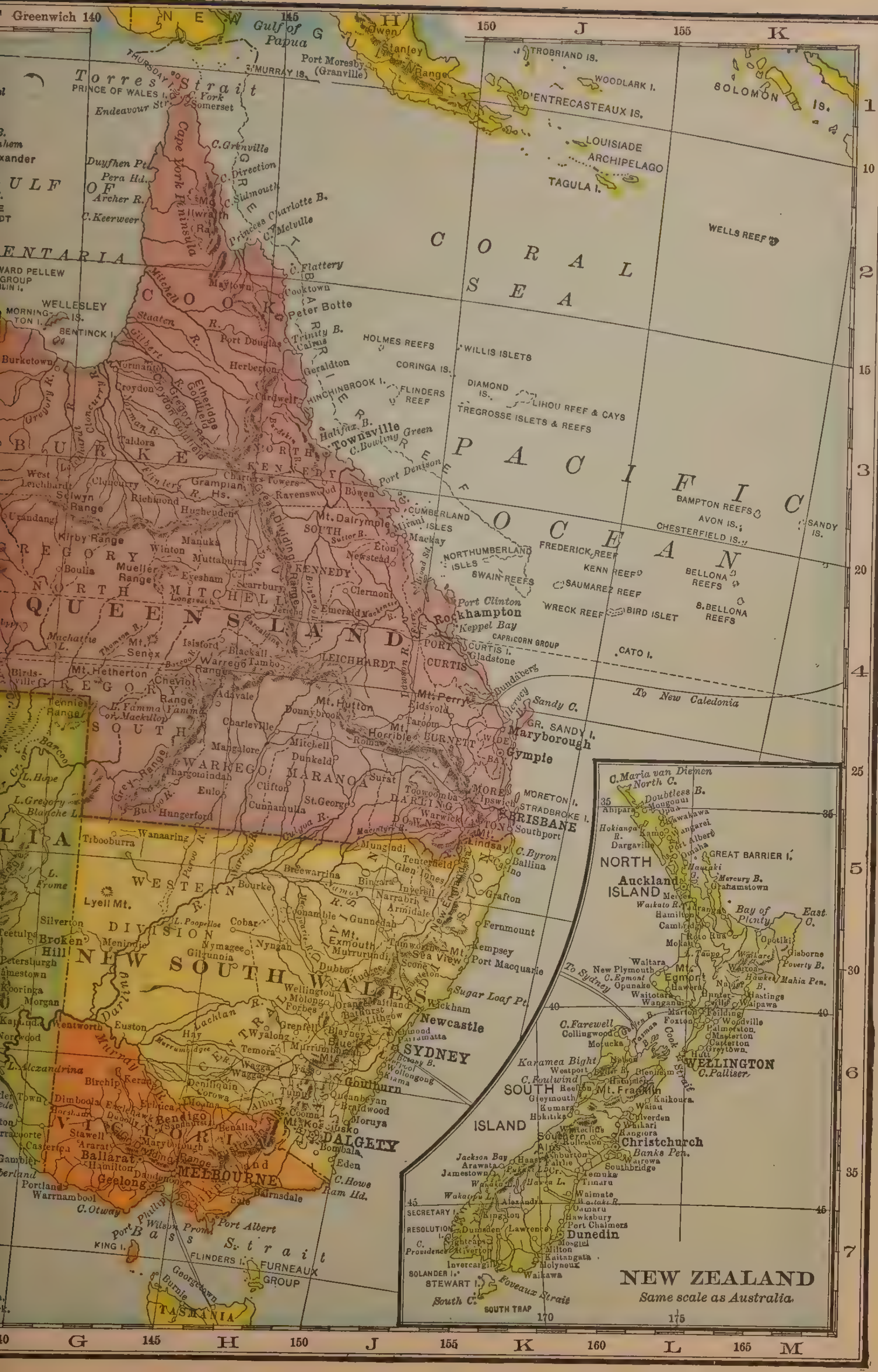
Climate. The climate of Australia is generally hot and dry, but healthful. In the tropical portions there are heavy rains, and in most of the coast districts there is a sufficiency of moisture, but in the interior the heat and drought are extreme. Considerable portions devoted to pasturage are liable at times to suffer from drought. At Melbourne the mean temperature is about 56°, at Sydney about 63°. The south-eastern settled districts are at times subject to excessively hot winds from the interior, which cause great discomfort and are often followed by violent cold winds from the south ("southerly bursters"). In the mountainous and more temperate parts snow-storms are common in winter (June, July and August).

Vegetation. The Australian flora presents peculiarities which mark it off by itself in a very decided manner. Many of the most striking features have an unmistakable relation to the general dryness of the climate. The trees and bushes have for the most part a scant foliage, presenting little surface for evaporation or thick leathery leaves well fitted to retain moisture. The most widely-spread types of Australian vegetation are the various kinds of gum-tree, the shea-oak, the acacia or wattle, the grass-tree, many varieties of other trees and a great number of ferns and tree ferns. Of the gum-tree there are found upward of 150 species, many of which are of great value. Individual specimens of the peppermint have been found to measure from 480 to 500 feet in height. As timber trees, the most valuable member of this genus is the red-gum, the timber of which is hard, dense and almost indestructible. A number of the gum-trees have deciduous bark. The wattle or acacia includes about 300 species, some of them of considerable economic value, yielding good timber or bark for tanning. The most beautiful and most useful is that known as the golden wattle, which in spring is adorned with rich masses of fragrant yellow blossom. Palms—of which there are 24 species, all except the cocoa palm peculiar to Australia—are confined to the south and east coasts. Among the so-called "scrubs," thickets of densely inter-twisted bushes occupy extensive areas. The mallee scrub is formed by a species of dwarf eucalyptus, the mulga scrub by a species of thorny acacia. A plant which covers large areas in the arid



AUSTRALIA

ENGLISH STATUTE MILES
0 50 100 200 300 400 500
KILOMETERS
0 100 200 300 400 500 600 700 800
Longitude East
INDIAN OCEAN
TIMOR SEA
ARAFURA
JAVA
LOMBOK I.
SUMBAWA I.
SUMBA OR SANDALWOOD I.
SAVU IS.
TIMOR
Kupang
ROTTI I.
CARTIER I.
SANDY I.
SCOTTS REEF
BROWSE I.
BUCCANEER ARCHIPELAGO
LACEPEDE IS.
ROWLEY SHOALS
MONTEBELLO IS.
BARROW I.
DAMPIER ARCH.
Northwest C.
Exmouth G.
C.Farquhar
C.Cuvier
BERNIER I.
DORRE I.
DIRK HARTOG I.
EDEL LAND
Geelvink Channel
HOUTMAN ROCKS
To Cocos Is.
BEAGLE IS.
KIMBERLEY
Wyndham
Mt. Cockburn
King Leopold
Kimberley Goldfield
Derby
Broome
DAMPIER LAND
Roebuck B.
C.Latouche Treville
C.Jaubert
Eighty Miles Beach
Condon
C.Thouin
Roebourne
Marble Bar
Pilbarra
Onslow
Mt. Bruce
Ophthalmia Range
Ashburton Goldfield
Mt. Labouchere
Gascoyne
Carnarvon
Shark B.
Gladstone
Mt. Murchison
Murchison
Nannine
Cue
Nicholson Ra.
L. Austin
Northampton
Yalgoo
Geraldton
Greenough
Dongara
Arrino
L. Moore
Marchagee
Southern Cross
Yilgarn Goldfield
Newcastle
Northam
York
Guildford
PERTH
Fremantle
Mt. William
Bunbury
Geographe B.
C.Naturaliste
Busselton
Port Augusta
C.Leeuwin
Flinders B.
D'Entrecasteaux Pt.
West C. Howe
King George Sd.
Albany
SOUTHWEST DIVISION
Broome Hill
Esperance
Willstead
WEST GROUP
ARCHIPELAGO OF THE RECHERCHE
EASTERN GROUP
EUCLA DIVISION
Hampton Table Land
Eyre
Eucla
Dundas Goldfield
Dundas Hills
Cowan L.
Lefroy L.
Coolgardie
Kanowna
Goldfield
Coolgardie
Menzies
Barlee L.
Mt. Margaret
Carey L.
Victoria Desert
L. Baron v. Mueller
L. Sir Thomas Elder
L. Wells
Mt. Shenton
Boomerang L.
L. Darlot
Barr Smith Range
Bundawadra Range
Mt. Russell
Kimberley Range
E. Murchison Goldfield
Mt. Bates
WESTERN AUSTRALIA
EASTERN DIVISION
TROPIC OF CAPRICORN
Dry Lakes
Gibson Desert
Alfred & Marie Range
L. Christopher
Rawlinson Range
Townsend Range
Barrow Range
Angas Range
Barons Range
Dover Hs.
Great Sandy Desert
Mt. Macpherson
Ridge Peak
Radi Hills
St. George Range
Cowan
Pilbarra Goldfield
NORTHWEST DIVISION
GASCOYNE
Salt L.
Nullarbor Plain
GREAT AUSTRALIAN BIGHT
NORTHERN TERRITORY OF SOUTH AUSTRALIA
SOUTH AUSTRALIA
Port Darwin
Palmerston
Southport
MELVILLE I.
BATHURST
Van Diemen G.
ARNHEM LAND
Pine Creek
Daly Waters
Victoria R.
Sea Range
Bitter Spring
Sandy Desert
Lake Woods
Whittington Range
Tennants Cr.
Murchison Range
Crawford Range
Barrow Cr.
Reynold Range
Mt. Stanley
Mt. Liebig
MacDonnell Range
Hart Range
Kintore Range
Lake Macdonald
Hermannsburg
James Ranges
Amadeus Lake
Musgrave Range
Mt. Morris
Mt. Hammersley
Mt. Sir Thomas
Birksgate Range
Alberga
Anzle Pool (Oodnadatta)
Dry Salt Lakes
L. Woorong
Stuart Range
Oolden Water (Youlden Depot)
Richards Desert
McDowall
Warburton Range
Everard L.
Gairdner L.
TELEGRAPH LINE
Pelumin
Columbia
C. Adieu
Port Eyre
NUYTS ARCH.
Streaky B.
Flinders
Anxious B.
INVESTIGATOR GROUP
WHIDBEY
Coffin B.
C.Catastrophe
Eyre Pen.
TASMANIA
Same scale as Australia
KING I.
HUNTER IS.
C.Grim
FLINDERS I.
FURNEAUX GROUP
BARREN I.
Banks Strait
C.Portland
George Town
Devonport
Ulverstone
Launceston
Scottsdale
St. Marys
Ben Lomond
Mt. Bischoff
Zeehan
Macquarie Har.
C.Sorell
Oatlands
Longford
HOBART
Oyster B.
MARIA I.
Tasman Pen.
C.Pillar
Storm B.
BRUNI I.
Port Davey
Southwest C.
Hammond's 8 x
C.S.Hamm



Greenwich 140
145
150
155
J
K
H
G
NEW
Gulf of Papua
Port Moresby (Granville)
Owen Stanley Range
THURSDAY I.
MURRAY IS.
Torres Strait
PRINCE OF WALES I.
C. York
Somerset
Endeavour Str.
TROBRIAND IS.
WOODLARK I.
D'ENTRECASTEAUX IS.
SOLOMON IS.
LOUISIADE ARCHIPELAGO
TAGULA I.
WELLS REEF
CORAL SEA
C. Grenville
C. Direction
C. Sidmouth
Princess Charlotte B.
C. Melville
Cape York Peninsula
Duyfhen Pt.
Pera Hd.
GULF OF
Archer R.
C. Keerweer
Mo. Ilwraith Ra.
GREAT BARRIER REEF
ENTARIA
WARD PELLEW GROUP
WELLESLEY IS.
MORNINGTON I.
BENTINCK I.
C. Flattery
Maytown
Cooktown
Peter Botte
COOK
Mitchell
Staaten R.
Gilbert R.
Port Douglas
Trinity B.
Cairns
Herberton
Geraldton
Burketown
HOLMES REEFS
WILLIS ISLETS
CORINGA IS.
DIAMOND IS.
LIHOU REEF & CAYS
TREGROSSE ISLETS & REEFS
HINCHINBROOK I.
FLINDERS REEF
Normanton
Croydon
Etheridge Goldfield
Gregory R.
Croydon Goldfield
Cardwell
Gregory R.
Cloncurry R.
Norman R.
Taldora
Halifax B.
Townsville
C. Bowling Green
BURKE
NORTH KENNEDY
PACIFIC OCEAN
Port Denison
West Leichhardt
Cloncurry
Selwyn Range
Flinders R.
Richmond
Grampian Hs.
Charters Towers
Ravenswood
Bowen
Urandangi
Hughenden
Mt. Dalrymple
CUMBERLAND ISLES
BAMPTON REEFS
AVON IS.
CHESTERFIELD IS.
SANDY IS.
Kirby Range
GREGORY
Winton
Manuka
SOUTH KENNEDY
Mirani
Mackay
Eton
Nebo
Newstead
NORTHUMBERLAND ISLES
SWAIN REEFS
FREDERICK REEF
KENN REEF
SAUMAREZ REEF
BELLONA REEFS
S. BELLONA REEFS
WRECK REEF
BIRD ISLET
CATO I.
Boulia
Mueller Range
Muttaburra
Evesham
NORTH
MITCHELL
Longreach
Scarrburg
Clermont
Jericho
Emerald
Mackenzie R.
Port Clinton
Rockhampton
Keppel Bay
CAPRICORN GROUP
CURTIS I.
Gladstone
PORT CURTIS
QUEENSLAND
Machattie L.
Thomson R.
Mt. Senex
Isisford
Blackall
Tambo
Warrego Range
LEICHHARDT
Dawson R.
Bundaberg
Mt. Hetherton
Birdsville
GREGORY
Cheviot Range
Adavale
Mt. Perry
Eidsvold
Sandy C.
Hervey B.
To New Caledonia
Tennier Range
L. Yamma Yamma
or Mackillop
SOUTH
Charleville
Donnybrook
Mt. Hutton
Taroom
Mt. Horrible
BURNETT
WIDE BAY
Maryborough
GR. SANDY I.
Gympie
Barcoo
L. Hope
L. Gregory
Blanche L.
Grey Range
Bulloo R.
Thargomindah
WARREGO
Mangalore
Mitchell
Dunkeld
MARANOA
Roma
Surat
Eulo
Cunnamulla
Clifton
St. George
Hungerford
Culgoa R.
Toowoomba
DARLING DOWNS
Warwick
MORETON
MORETON I.
STRADBROKE I.
Ipswich
BRISBANE
Southport
Mt. Lindsay
C. Byron
Ballina
Casino
LIA
Tibooburra
Wanaaring
Paroo R.
Warrego R.
Macintyre R.
Mungindi
Tenterfield
Glen Innes
Inverell
Bingara
Brewarrina
Bourke
Grafton
Narrabri
Armidale
L. Frome
WESTERN
Lyell Mt.
DIVISION
Silverton
Broken Hill
Petersburgh
Jamestown
Cobar
L. Poopelloe
Coonamble
Gunnedah
Fernmount
Kempsey
Port Macquarie
Menindie
Nymagee
Girilambone
Nyngan
Mt. Exmouth
Murrurundi
Tamworth
Sea View Mt.
NEW SOUTH WALES
Dubbo
Mudgee
Scone
Singleton
Sugar Loaf Pt.
Darling R.
Wellington
Molong
Orange
Bathurst
Maitland
Lithgow
Wickham
Newcastle
Kooringa
Morgan
Forbes
CENTRAL
Lachlan R.
Euston
Wentworth
Hay
Grenfell
Wyalong
Blayney
Blue Mts.
Parramatta
Elwood
SYDNEY
Botany B.
Wollongong
Kiama
Murrumbidgee R.
Murray R.
Temora
Wagga Wagga
Yass
Goulburn
L. Alexandrina
Birchip
Kerang
Deniliquin
Corowa
Moama
Albury
Tumut
Queanbeyan
Braidwood
Cooma
Moruya
Mt. Kosciusko
DALGETY
Bombala
Eden
C. Howe
Ram Hd.
Dimboola
Horsham
Echuca
Bendigo
Sandhurst
Benalla
Stawell
Ararat
VICTORIA
Maryborough
Dividing Range
Castlemaine
Ballarat
Hamilton
Dandenong
MELBOURNE
Geelong
Sale
Bairnsdale
Portland
Warrnambool
C. Otway
Port Phillip
Wilson Prom.
Port Albert
Bass Strait
KING I.
FLINDERS I.
FURNEAUX GROUP
Georgetown
Burnie
TASMANIA
To Sydney
NORTH ISLAND
C. Maria van Diemen
North C.
Doubtless B.
Mongonui
Ahipara
Kawakawa
Opua
Hokianga R.
Kamo
Whangarei
Dargaville
Port Albert
Omaha
GREAT BARRIER I.
Mauaki
Mercury B.
Grahamstown
Auckland
Mercer
Waikato R.
Hamilton
Cambridge
Tauranga
Bay of Plenty
East C.
Roto Rua
Opotiki
Mokau
L. Taupo
Waikare
Gisborne
Poverty B.
Waitara
New Plymouth
C. Egmont
Opunake
Mt. Egmont
Hawera
Waitotara
Wanganui
Napier
Hawke B.
Mahia Pen.
Hastings
Waipawa
Hunterville
Marton
Feilding
Foxton
Woodville
Palmerston
Masterton
Carterton
Greytown
Hutt
WELLINGTON
C. Palliser
C. Farewell
Collingwood
Motueka
Nelson
Tasman B.
Cook Strait
Blenheim
Karamea Bight
Westport
C. Foulwind
Reefton
Hanmer
Mt. Franklin
Kaikoura
Waiau
Greymouth
Kumara
Hokitika
SOUTH ISLAND
Culverden
Waikari
Rangiora
Christchurch
Banks Pen.
Rolleston
Southern Alps
Waitekoa
Ashburton
Jackson Bay
Arawata
Jamestown
Haast
Wanaka L.
Pukaki L.
Ohau L.
Tekapo L.
Temuka
Timaru
Southbridge
Fairlie
Waimate
Wakatipu L.
Alexandra
Oamaru
Kakanui
SECRETARY I.
RESOLUTION I.
Kingston
Hawkesbury
Port Chalmers
Dunedin
C. Providence
Lawrence
Mosgiel
Milton
Kaitangata
Molyneux
Invercargill
Riverton
Waikawa
SOLANDER I.
STEWART I.
Foveaux Strait
South C.
SOUTH TRAP
NEW ZEALAND
Same scale as Australia
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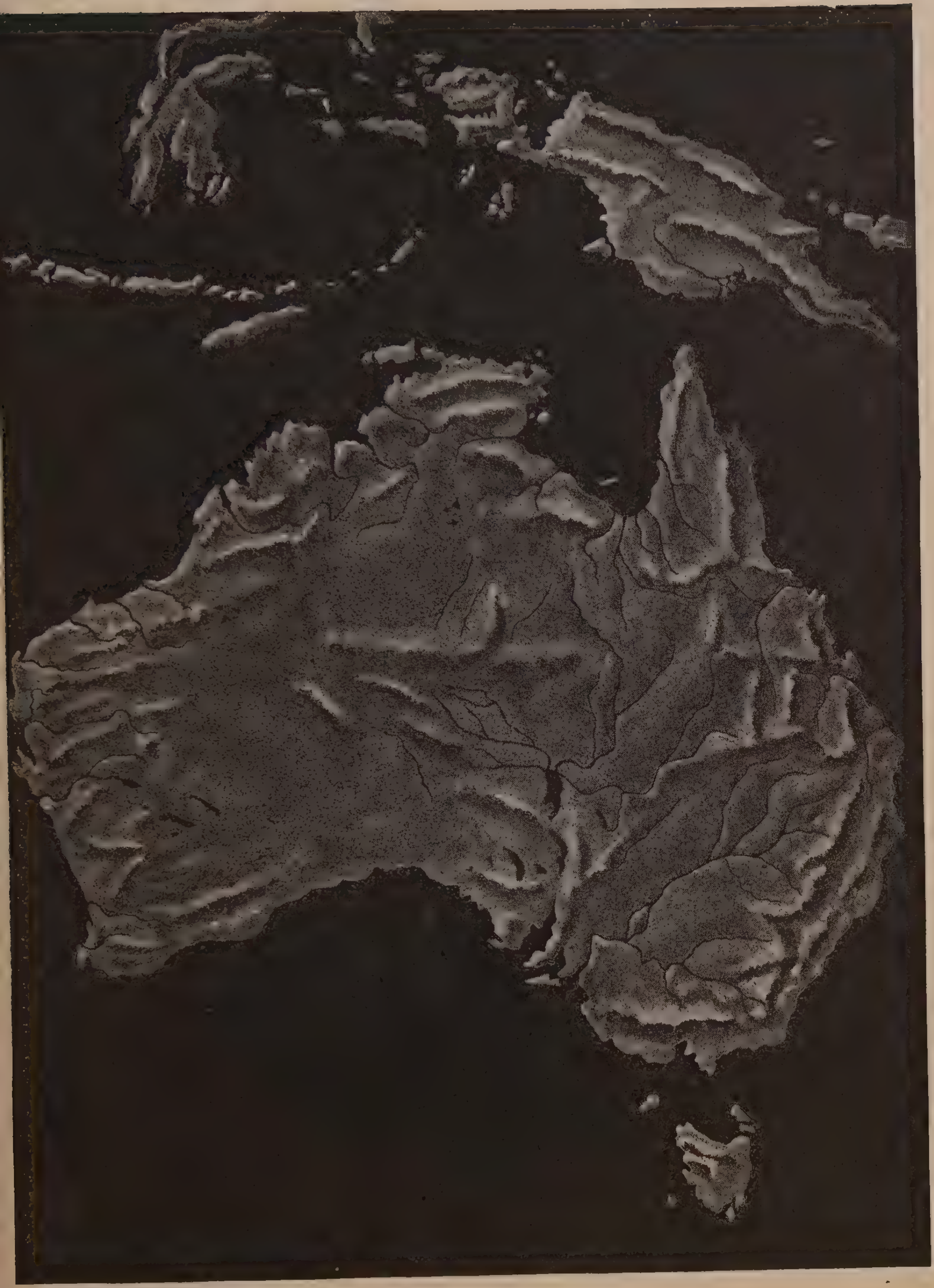


RELIEF MAP OF AUSTRALIA

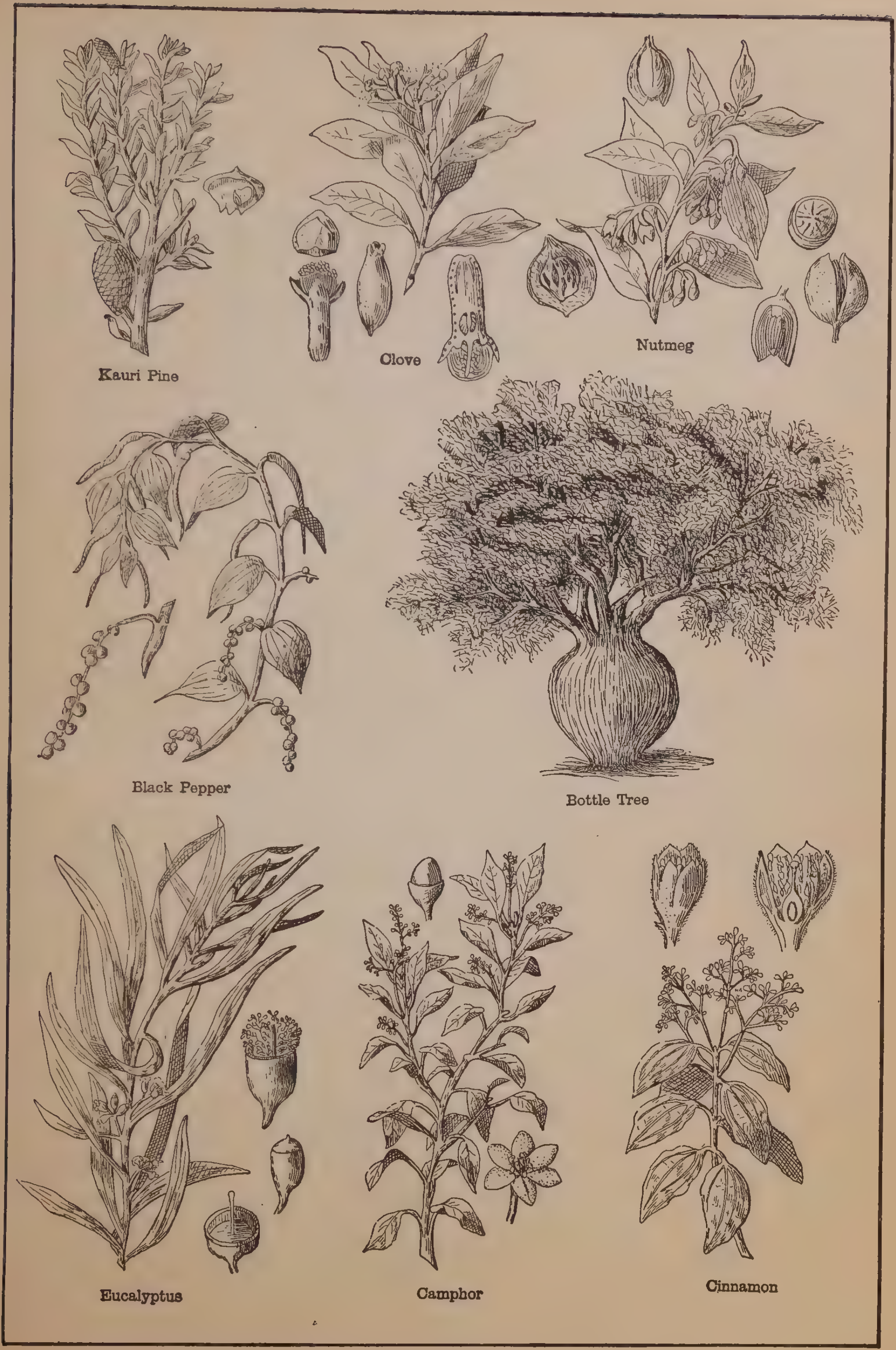
regions is the spinifex or porcupine grass, a hard, coarse and excessively spiny plant, which renders traveling difficult, wounds the feet of horses and is utterly uneatable by any animal. Australia posseses great numbers of turf-forming grasses, such as the kangaroo-grass, which survives even a tolerably protracted drought. The native fruit trees are few and unimportant, and the same may be said of the plants yielding roots used as food. The vine, the olive and the mulberry thrive well, and quantities of wine are now produced. The cereals of Europe and maize are extensively cultivated, and large tracts of country, particularly Queensland, are under sugar-cane.

Animal Life. The animal life is as peculiar as the vegetable. Its great feature is the nearly total absence of all the forms of mammalia which abound in the rest of the world, their place being supplied by a great variety of marsupials (See Marsupialia), these animals being nowhere else found, except in the opossums of America. There are about 110 kinds of marsupials (of which the kangaroo, wombat, bandicoot and phalangers, or opossums, are the best known varieties), over 20 kinds of bats, a wild dog (the dingo) and a number of rats and mice. Two extraordinary animals, the platypus, or water-mole of the colonist (Ornithorhynchus), and the porcupine ant-eater (Echidna) constitute the lowest order of mammals, and are confined to Australia. Their young are produced from eggs. There are upward of 650 different species of birds, the largest being the emu, or Australian ostrich, and a species of cassowary. Peculiar to the country are the black swan, the honey-sucker, the lyre bird, the brush turkey and other mound-building birds. The parrot tribe is the most numerous of all. There are many reptiles, the largest being the crocodile, found in some of the northern rivers There are upward of 60 different species of snakes, some of which are very venomous. Lizards, frogs and insects are also found in great numbers, and the seas, rivers and lagoons abound in fish of numerous varieties, and other aquatic animals, many of them peculiar. Whales and seals frequent the coasts. On the northern coasts are extensive fisheries of trepang, much visited by native traders from the Indian Archipelago.

Inhabitants. According to the census of 1901, the total population of the Commonwealth of Australia, including the island of Tasmania, was 3,600,000. About 60,000 of these are native races. The natives of Australia belong to the Australian negro stock and are sometimes considered the lowest, as regards intelligence, in the whole human family. They are of a dark brown or black color, have curly but not woolly hair, and are of medium size but inferior muscular development. In the settled parts of the continent they are inoffensive, and are rapidly dying out. They have no fixed habitations; in the summer they live almost entirely in the open air, and in the more inclement weather they shelter themselves with bark dwellings of the rudest construction. They neither cultivate the soil nor domesticate animals. Their food consists of such animals as they can kill, and no kind of living creature seems to be rejected —snakes, lizards, frogs and even insects being eaten, often half raw. They are ignorant of the potter's art. In their natural condition they wear little or no clothing. The women are regarded merely as slaves and are frightfully maltreated. They have peculiar marriage rites. They are occasionally employed by the settlers in light kinds of work, and as horse-breakers, but they dislike continuous occupation and soon give it up. The weapons of all the tribes are generally similar, consisting of spears, shields, boomerangs, wooden axes, clubs and stone hatchets.

Political Divisions. The entire continent is a colony of Great Britain and is divided into the following states: Queensland, New South Wales and Victoria, occupying the eastern portion of the continent; South Australia, together with the northern territory, occupying the central portion; and Western Australia, which includes a little more than the western third of the continent.

History. The date of the discovery of Australia is uncertain, but previous to 1542 the Portuguese published an account of the existence of a land which corresponded to Australia, and they were probably the first Europeans to see the continent. A Portuguese navigator visited Australia in 1601, and five years later the Spaniard Torres passed through the strait that bears his name. Within the next twenty-five years most of the coast line was surveyed by Dutch navigators, and in 1664 it was named New Holland by the Dutch government. Australia came into the possession of Great Britain in 1770. The first English settlement was made at Botany Bay in 1788 by some convicts who were transported by the government. These were followed by other colonists, the first settlements all being made along the eastern coast, from the



PLANTS OF AUSTRALIA

north southward. Following these were expeditions into the interior, though no one succeeded in crossing the mountains until 1813. The discovery of gold in 1851 and 1852 led to extensive immigration, and the development of Australia along all industrial lines dates from that event. The present political divisions were first formed as independent colonies, and then were joined in the federation of the Commonwealth of Australia in 1900. See AUSTRALIA, COMMONWEALTH OF.

Australia, COMMONWEALTH OF, a British dependency consisting of the federated states of Australia and Tasmania. In area the commonwealth includes the continent of Australia and the island of Tasmania. The physical features, mineral resources, climate, animal and vegetable life and inhabitants are described in the article AUSTRALIA. This article deals with the industries, cities, institutions and government of the people.

MINING. Since 1852 gold-mining has constituted one of the most important industries; it employs over 83,000 men, and the yearly output is about $87,000,000. The leading states in the order of their production are Western Australia, Victoria, Queensland and New South Wales. Other important mineral products are silver, the annual output being valued at about $12,330,000; copper, whose value is about $9,300,000 annually; coal, with an annual value of $8,250,000, and tin, exceeding $2,000,000 in annual value. New South Wales leads in the production of silver and coal, and Tasmania in the production of copper and tin. As the gold mines become exhausted, gold mining decreases and the mining of silver and other metals increases.

AGRICULTURE. The climate and soil of Australia are adapted to the production of nearly all grains and fruits grown in the warm temperate and semi-tropical regions, but because of lack of rainfall only a small portion of the country is under cultivation. This is almost wholly confined to the eastern section on both sides of the mountains. The condition of the interior very closely resembles that of certain portions of the great plains and plateaus in the United States, and it is found that this yields to irrigation in a similar manner; consequently, in the western portions of Queensland and New South Wales and in some parts of South Australia, irrigation by means of artesian wells and streams is practiced with great profit.

The entire region, wherever there is sufficient rainfall for grass, is especially adapted to grazing and is one of the most suitable regions in the world for raising sheep; consequently, the number of these animals found in Australia exceeds that in any other country, and Australia is the largest wool-producing country in the world. Cattle are also raised in large numbers in Queensland and some of the other states. By means of refrigeration, mutton and beef can be exported to excellent advantage; consequently, stock-growing is a profitable occupation.

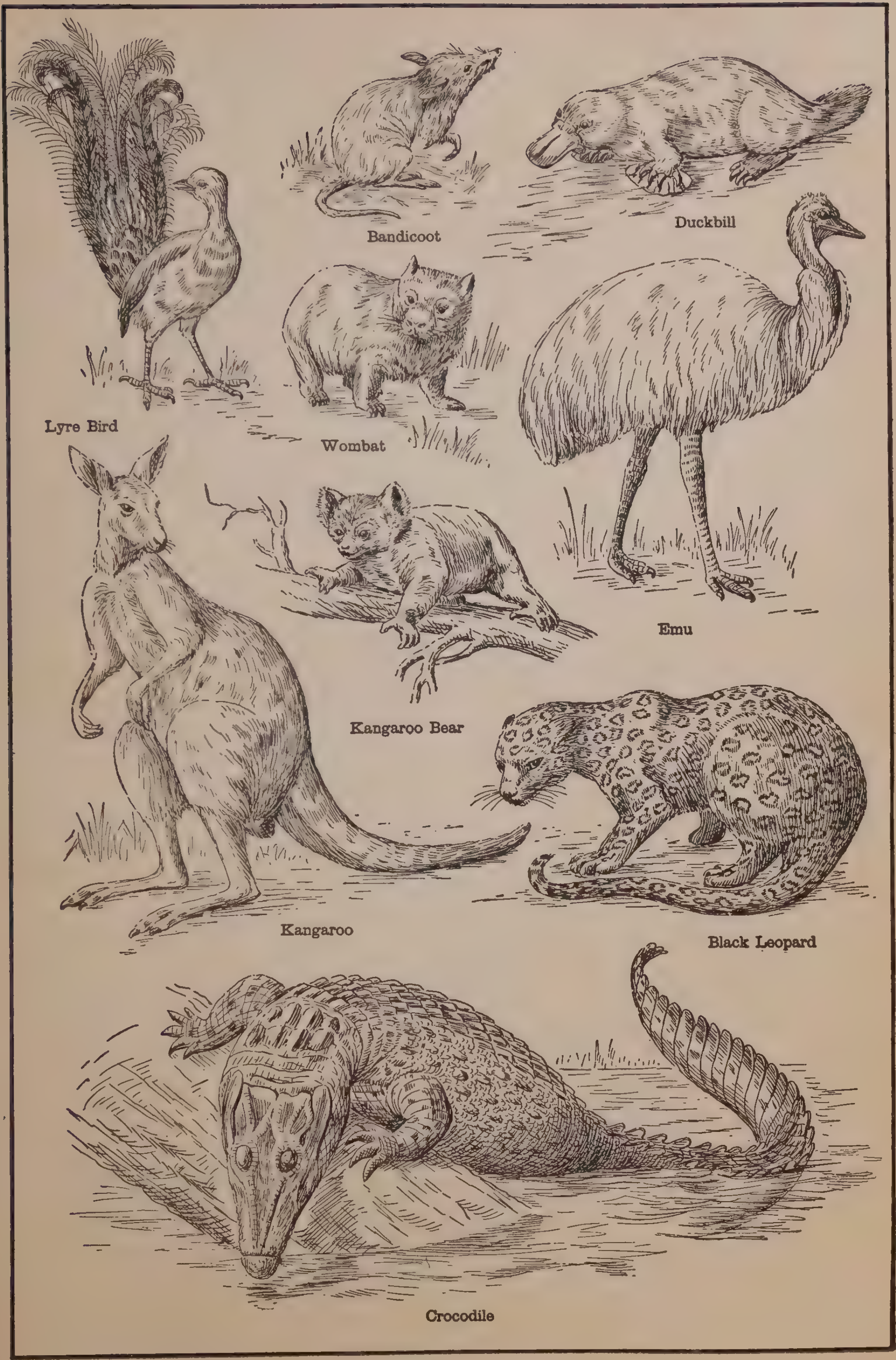
The leading crops are wheat, corn and hay, though but little more of any crop is grown than is required for home consumption. Grapes, coffee, bananas and other fruits are successfully grown, but fruit-raising is not one of the chief industries.

MANUFACTURES. The manufactures are limited and are confined almost entirely to those industries which are connected with the preparation of raw material obtained from the agricultural regions, the preparation of food products, the manufacture of textiles, clothing, iron products and machines. The large income obtained from mining and raising live stock has precluded the establishing of manufactures on any extended scale, since most of the manufactured products can be obtained cheaper from other countries than they can be made at home.

TRANSPORTATION. The country is almost entirely devoid of navigable rivers; hence, for inland transportation it must rely on railways and carriage roads. There are over 13,000 miles of railway, including 500 miles in Tasmania. Trunk lines now connect all the important cities and many of the large towns in the four eastern states. Nearly all of these lines are owned and operated by the government. In fact, it was only by government aid that their construction was made possible, since the sparsely settled condition of the country would not warrant sufficient revenue to induce private capital to construct the lines. Telegraph lines connect all the important towns and extend across the continent from north to south and from east to west. These and most of the telephone lines are also owned and operated by the government.

By means of the British Pacific Cable and connection with the American Pacific Cable, as well as by lines connecting with Asiatic ports, Australia has direct telegraphic communication with all countries of the world.

The location of Australia and its adaptability to the production of agricultural products at little expense give it an extensive trade, exceeding



ANIMALS OF AUSTRALIA

per capita that of any other country in the world except Belgium. The exports consist of wool, gold, hides and meats, while the imports consist of manufactured products.

GOVERNMENT. The Commonwealth of Australia is a federation of states, nominally subject to Great Britain, but independent as far as all acts relating to the welfare of the federated states are concerned. The crown appoints the governor general, and the highest court of Great Britain has power to review, under certain limited conditions, the acts of the highest court of the commonwealth The federation is based upon a constitution which very closely resembles that of the United States. The legislative power is vested in a parliament consisting of two branches, a senate and a house of representatives, the members of each to be elected by the people of the different states. The senators are elected for six years and the representatives for three years. At the organization of the government each state was allowed six members in the senate, and it was provided that half the number of senators should retire every three years, but they are eligible for reëlection. The number of members in the house of representatives is as nearly as possible twice the number of senators. The federal parliament may extend the voting powers of the people, but cannot restrict them. All revenue bills must originate in the house of representatives, and the course of procedure is similar to that in the Congress of the United States.

The executive department consists of the governor general and a ministry, the members of which are members of the parliament. In this respect the executive department radically differs from that of the United States. At the head of the judicial departments is a high court of justice, which may hear appeals from all federal courts, from supreme courts of the states and from the interstate commission. Appeals from the decisions of the high court to the British Privy Council may be taken on questions involving the limits of the constitutional powers of the commonwealth or of the different states, provided the high court certifies that the question is one which ought to be determined by the Council. All rights are reserved to the states unless they have been specifically delegated to the federal government.

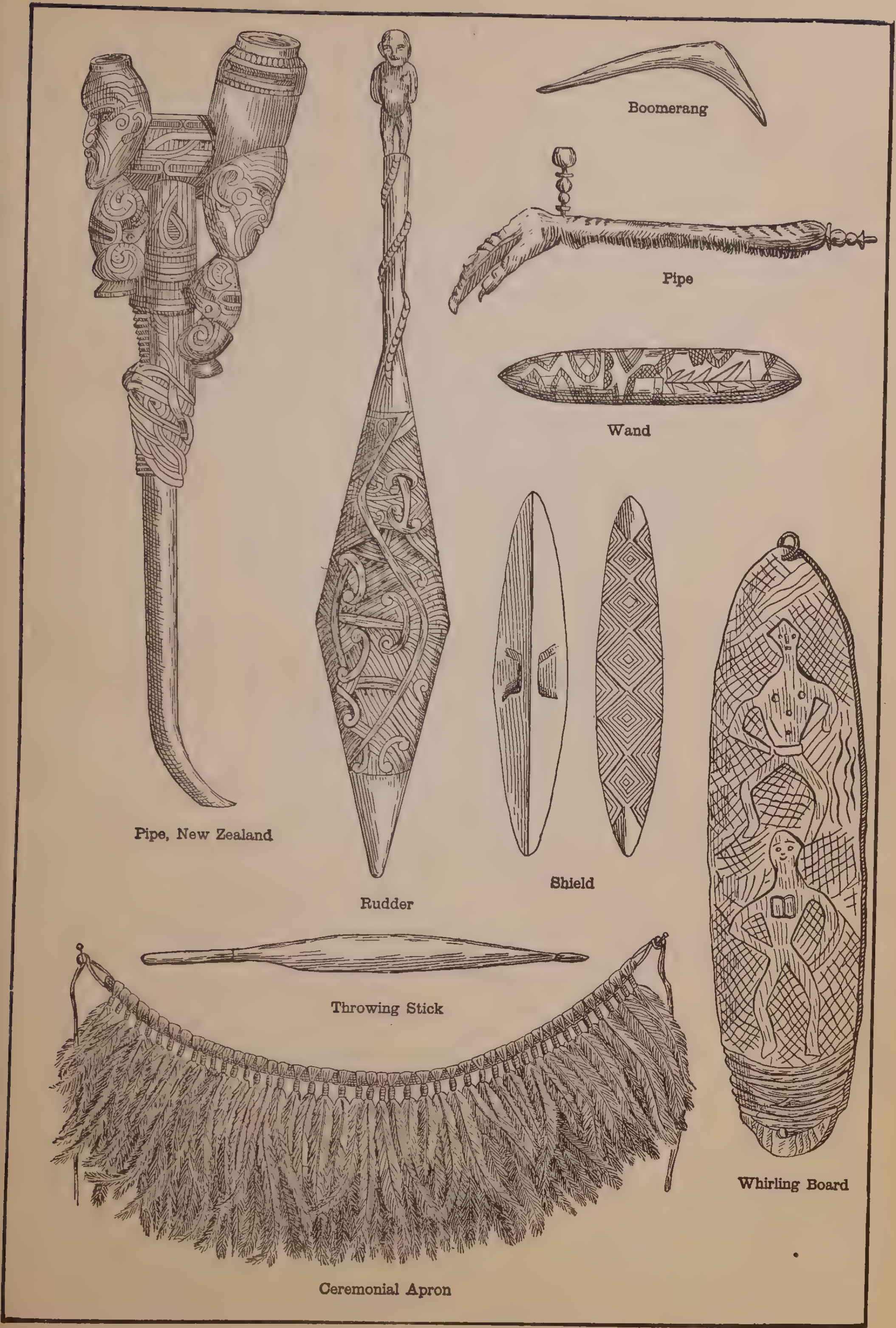
The constitution of Australia is regarded by many students of politics as a step in advance of any constitution that has previously been prepared. In addition to the ordinary functions assumed by the national government, the Australian government assumes control of banking and insurance, marriage, divorce, parental rights and guardianship, naturalization and the control of immigration and of foreign races within the state. It also has control of most of the telegraphs, telephones and railway lines now constructed and has authority to obtain control of others, with the consent of the state through which the lines extend.

Australia has also made great advancement in settling important sociological and governmental problems, such as the conflicts between labor and capital, the construction and maintenance of highways, irrigation, savings banks, the assisting of agriculture by reduced freight rates and transportation of seeds and agricultural instruments, and in times of drought in the transportation of stock. The government has also from time to time appropriated large sums for assisting agriculture in such ways as exterminating injurious insects and animals, advancing loans to farmers, and granting bounties to those farmers who are willing to found new industries, such as the manufacture of dairy products and the introduction of new crops. There are no social orders or titles of distinction in the country. Education is practically free and is compulsory except in secondary schools and universities. Most of the secondary schools are under denominational control, and the universities at Adelaide, Melbourne, Sydney and Tasmania are partially maintained by government support. There is no state religion, but the Episcopal church, which is an offshoot of the Church of England, has the largest number of followers. In addition to the article on Australia, see NEW SOUTH WALES; QUEENSLAND; SOUTH AUSTRALIA; WESTERN AUSTRALIA; VICTORIA; TASMANIA; also ADELAIDE; BRISBANE; MELBOURNE; SYDNEY. Consult *The Story of Australia*, in the Stories of the Nations Series.

Austra'lian Ballot. See BALLOT.

Australian Star-flower. See BURBANK, LUTHER.

Aus'tria-Hun'gary or **Austro-Hungarian Monarchy,** a dual kingdom situated in the southeastern part of Europe, extending from 42° to 51° north latitude, and from 9° 30′ to 26° 30′ east longitude. Its greatest length from east to west is 800 miles, from north to south 650 miles, and the area is 261,000 square miles, or about the same as that of the State of Texas. The population in 1900 was 45,359,204. The boundary line is very irregular. It is bounded on the n.



NATIVE AUSTRALIAN HANDIWORK

by Germany and Russian Poland, on the e. by Russia and Rumania, on the s. e. by Rumania, Servia, Turkey and Montenegro, on the s. w. by the Adriatic Sea, on the s. by Italy and on the w. by Switzerland and the German Empire.

Surface and Drainage. In its western and northern portions Austria is the most mountainous country of Europe, except Switzerland. Spurs of the Alps extend into all of the western provinces, and Tyrol, the most westerly of all, is famous for the grandeur and beauty of its mountain scenery. In this section of the country there are many lofty peaks, some of which attain a height of nearly 13,000 feet. The Carpathian Mountains extend along the northern boundary for a distance of 800 miles, and attain a height of 8737 feet in their highest peak. The western prolongation of these mountains is known as the Riesengebirge, and west of these and running in a nearly north and south direction is the Erzgebirge range, which forms the boundary between Austria and Bavaria (See Alps; Carpathian Mountains). The eastern portion of the Empire, or Hungary, is divided into two great plains, that south and west of the Danube, known as the Little Hungarian Plain and having an area of about 4500 square miles, and the Great Hungarian Plain, between the Danube and the Carpathians, which covers an area of between 25,000 and 30,000 square miles. This plain is a vast level tract of land, noted for its fertile soil and numerous farms. It has but few elevations. On the south and southeast there are low mountain ranges which form the natural boundary between Hungary and the bordering states, and in the northern part of the great plain some spurs of the Carpathians extend for a short distance in a north and south direction.

The country is drained by the Danube and its tributaries, those on the north being the Theiss and its tributary, the Maros, and those on the south and west being the Raab and the Drau or Drave (See Danube River). The Elbe and its prolongation, the Moldau, drain the northwestern portion of the empire and form a water outlet to the Baltic. The mountainous regions of Austria contain numerous small lakes noted for their beauty.

Mineral Resources. Compared with other European countries, the Empire is rich in minerals. Ores of gold, silver. copper iron, lead, tin, zinc, nickel and other minerals are found in the mountainous regions, and coal is also an important product. The salt mines of Wieliczka and Galicia, in the eastern part of the Carpathians, have been noted for centuries. Austria is the largest producer of gold of all European countries, and many of these mountain mines have been worked since the days of the Roman Empire.

Climate. Austria-Hungary is divided into three climatic regions. The northern, including most of Bohemia and Galicia, has long, cold winters and short, temperate summers. The central region, which extends through the middle portion of the Empire between the 46th and 49th degrees of latitude, has a mean annual temperature of about 50°, and the southern region has a mild and, in some localities, almost semi-tropical climate. The rainfall varies greatly in different parts of the Empire. In some of the mountainous regions it exceeds 100 inches per year, while in lower Austria, Moravia and Silesia it averages only about 25 inches; but throughout the country there is sufficient moisture for agriculture.

Agriculture. Agriculture is the most important industry of the country. The great variety of surface and altitude, combined with the abundance of rainfall, enable a large number of agricultural products to be produced with success. In general, the Austrian provinces lead in the production of the sugar beet, tobacco, hemp, flax, hops, barley and potatoes, while the great plains of Hungary are devoted to raising cereals and live stock. This section of the country is often called the granary of Europe. Wheat is the most important Hungarian crop, and in some respects this country rivals the United States in the production of this important cereal. Tropical fruits, melons, hops and barley are also raised in large quantities. In the southeastern portion oranges, lemons and olives are grown with profit

Manufactures. Nearly one-third of the Empire is covered with forests which contain valuable timber trees, and the manufacture of lumber is an important industry. Hungary exceeds all other European countries in the manufacture of flour, and the output averages about $35,000,000 annually. It was in this country that the present process of making flour was discovered. The Bohemians have been famed for centuries for their skill in the manufacture of glass, and their artware is found in all civilized lands. Pottery of excellent quality is also manufactured here. There are also important manufactures of woodenware, iron and steel, and cotton and woolen goods. The leading industries are carried on on a large scale, resembling very closely the methods used in the United States. All manufactures are characterized by the use of the most modern methods and the best of machinery. Beet sugar is one of the important food products manufactured, and in this industry Austria-Hungary is one of the leading countries.

TRANSPORTATION. The Danube and its tributaries are navigable and furnish important waterways to the portions of the country through which they flow. There are also numerous canals connecting these and other rivers. In addition, the country has over 24,000 miles of railway connecting all of the principal cities and towns. More than half of the railway mileage is under control of the government. The mail facilities and the telegraph and telephone systems are also adequate to the needs of the country. Owing to her short extent of seacoast, Austria-Hungary has a smaller merchant marine than most other European nations, and less of her commerce is carried by water. Nearly all of the internal and foreign trade finds transportation over the rivers or railways.

COMMERCE. The commerce of the country is important notwithstanding the difficulties of transportation. The leading articles of export are timber, sugar, live stock, wheat, flour, glass, porcelain and leather goods, while the imports consist of manufactured articles and raw material for the factories. The leading countries engaged in foreign trade are Germany, Great Britain and Italy. The trade with the United States is inconsiderable.

INHABITANTS AND LANGUAGE. Next to Russia, Austria-Hungary contains a greater number of races and a greater variety of languages than any other European country. The people of German descent predominate in the Austrian provinces, and here the German language is generally spoken. Hungary is divided between the Slavs and the Magyars, or Hungarians. Each of these races is subdivided into numerous local divisions, varying somewhat in language and customs. In Hungary the Hungarian and Slavic languages are spoken. The country also contains Jews, Armenians and some Italians.

EDUCATION. The empire maintains an excellent system of public schools, which are under the control of a department of public instruction, but each province is held responsible for the management of its own schools. The system used conforms very closely to that of Germany. The Empire is especially noted for the excellence of its technical schools and of its great universities, especially those located at Vienna and Prague. See VIENNA, UNIVERSITY OF; also EDUCATION, NATIONAL SYSTEMS OF.

ARMY. See ARMY, subhead *Austro-Hungarian Army.*

GOVERNMENT. The Austro-Hungarian Monarchy consists of two separate governments, whose only bond of union, practically, is the ruler, who is at once emperor of Austria and king of Hungary. All matters affecting the joint interests of the two divisions of the Empire, such as foreign affairs, war and finance, are dealt with by a legislative body consisting of two Delegations, one chosen by the Austrian diet and one by the Hungarian diet. These two Delegations meet alternately at Vienna and Budapest, and deliberate separately, meeting in common only when they are unable to agree after three communications with each other.

Austria, independent of Hungary, has a government of its own. The emperor is the source of law and justice. He not only legislates concurrently with the *Reichsrat* and with the provincial diets, but makes treaties, issues decrees, grants pardons and summons and dissolves the legislatures; but every act of his must be countersigned by a minister, who is thus held responsible to parliament. This *Reichsrat* consists of two houses, the house of lords (*Herrenhaus*) and the house of representatives (*Abgeordnetenhaus*). The franchise is limited only by a slight property restriction; the parliament consists of representatives of social classes and of the various provinces. The executive branch of the government is managed by eight departments, each with a minister, together with two ministers who have no special duties. Local government is carried on through the provinces, each of which has a diet, consisting of one house, and an executive, consisting of a committee, with a president appointed by the emperor and a number of members elected by the diet. Every province is also a *department,* which is administered by a governor appointed by the emperor. A department is divided into *districts* and *communes.* The system of courts includes district courts, higher circuit courts, provincial courts and the Supreme Court of Justice and Cassation at Vienna, besides other courts having special jurisdictions.

The government of the kingdom of Hungary is in form similar to that of Austria, but the king plays a less important part than in Austria. The Parliament is composed of two houses, the table of magnates and the house of representatives, the members of the upper house consisting of certain representatives of the royalty, the nobility and the Church and other peers nominated by the crown; the lower house, of representatives elected by the people with a fairly general franchise. The executive power is vested in a cabinet consisting of nine ministers, each ruling a department, and a minister president. It is responsible to the parliament. For purposes of local government, Hungary is divided into 63 *counties*, at the head of each of which is a governor. Within the counties are *incorporated towns*, which are governed by magistrates, and *presidencies*. The latter in turn are divided into greater and smaller *communes*, over each of which is a legislative body, half appointed and half elected. The presidencies are only administrative units. The system of courts is in general similar to that of Austria.

Cities. The important cities are Vienna, the capital and commercial center, Budapest, Prague, Triest and Fiume, which is fast becoming an important seaport. Each of these cities is described under its title.

History. In 796 Charlemagne drove the Avars from the territory between the Enns and the Raab and united it to his empire as a margravate, and from the establishment of this margravate the present Austro-Hungarian Monarchy took its rise. In 900 the Hungarians descended upon the country and gained possession of it, but half a century later they were driven out by Otho I and the province was reunited to the German Empire. From 982 to 1156 the margravate was hereditary in the dynasty of the Babenbergs, and it was during this time that the name *Oesterreich* (eastern country), from which is derived our name Austria, was given to the country. In 1156 the territory west of the Enns was annexed to Austria, and the whole was made a duchy. From this time on there were various accessions of territory, and the rulers of Austria increased their power until in 1282 Ottokar, one of the strongest of the dukes, ventured to resist the authority of the emperor, Rudolph of Hapsburg. Ottokar was killed in the struggle, and in 1282 Rudolph assigned the territory to his own sons, Albert and Rudolph. From that time until the present the family of Hapsburgs has ruled in Austria. During the two centuries that followed, the country was constantly disturbed by wars, either with rebellious subjects or with neighboring provinces, but the duchy grew constantly in extent and in its influence in Germany. On the death of his father-in-law in 1438, Albert V, son-in-law of the emperor Sigismund, became king of Bohemia and Hungary and was also chosen emperor as Albert II. So great had the power of the Austrian house become in Germany, that from this time on the Hapsburgs were able almost always to secure the imperial dignity for themselves.

In 1453, under Frederick III, Austria became an archduchy, and by the marriage of Frederick's son Maximilian to Mary, daughter of Charles the Bold of Burgundy, the Netherlands were annexed to the Austrian possessions. Maximilian, when he became emperor on the death of his father in 1493, transferred the government of the Netherlands to his son Philip, who by his marriage with Joanna of Spain secured possession of the Spanish throne for the Hapsburgs. Philip died before Maximilian, and Charles I of Spain, the son of Philip, succeeded Maximilian as emperor in 1519. He abdicated the imperial throne in 1556 and his brother, Ferdinand I, succeeded him. Ferdinand, by his marriage with the sister of the king of Hungary and Bohemia, had succeeded to the rule of those countries; but a rival king had been elected in Hungary, and it was only after a long struggle that Ferdinand's hold on a part of Hungary was confirmed. When Ferdinand died in 1564, his son Maximilian II succeeded him as ruler of Austria and as king of Hungary and Bohemia, and he on his death was succeeded by his son, Rudolf II. Matthias, the brother of Rudolf, attained the imperial dignity in 1612 and he had his cousin, Ferdinand of Styria, made king of Bohemia and Hungary. The refusal of the Bohemians to accept as their king the Catholic Ferdinand brought on the Thirty Years' War, in which Austria represented throughout the interests of the Catholics (See Thirty Years' War).

Leopold I, the grandson of Ferdinand, who came to the throne in 1657, proved to be a most despotic ruler, and under his tyranny Hungary revolted. With the aid of the Turks, this revolt bade fair to be successful, and the Turks had actually advanced to Vienna and begun a siege, when John Sobieski came to the aid of the city and defeated the besieging army. Leopold was able by 1687 to compel the Hungarians to recognize their country as part of the hereditary possessions of Austria. It was during the reign of Leopold that the question as to the succession to the Spanish throne arose, culminating in the War of the Spanish Succession (See SUCCESSION WARS, subhead *War of the Spanish Succession*). Joseph I succeeded to the imperial throne during this war and, dying before its close, was followed by Charles VI. By the Peace of Utrecht in 1713 Austria came into possession of the Spanish Netherlands, Milan, Naples and Sardinia, but some years later, after the War of the Polish Succession, lost much of this territory.

Charles VI had no sons, but by the Pragmatic Sanction he attempted to secure the throne to his daughter, Maria Theresa. The attempts of the other powers to curtail the possessions of Maria Theresa after her accession to the throne, resulted in the War of the Austrian Succession (See CHARLES VI; MARIA THERESA; SUCCESSION WARS, subhead *War of the Austrian Succession*). During the War of the Austrian Succession, the emperor Charles VII died, and Francis, the husband of Maria Theresa, was chosen emperor as Francis I. The Seven Years' War, into which Austria was plunged for the sake of regaining Silesia, brought no advantages (See SEVEN YEARS' WAR). When Francis I died in 1765, his son, Joseph II, was made joint ruler with his mother. His reign was largely taken up with attempted reforms, which, however, met with determined resistance throughout his dominions and were the cause of revolts. Leopold II succeeded Joseph, and he was on the throne when the French Revolution broke out. He died before his plans for a resistance to the radical republicanism in France could be fully matured, but his son, Francis, who came to the throne in 1792, carried out his father's projects. In the war with France in Italy, Austria lost some of her Italian possessions, but gained Venice. In 1804 Francis took the title of *Hereditary Emperor of Austria* and two years later, on the founding of the Confederation of the Rhine, he renounced the title of *Holy Roman Emperor*. Austria suffered much in the Napoleonic campaign of 1809, but in the following year, through the marriage of Napoleon with Maria Louisa, daughter of Francis, was won to an alliance with Napoleon. This lasted but a short time, and Austria had a part in all of the last campaigns against France, and received at the settlement in the Congress of Vienna much of her old territory which had been taken from her by Napoleon.

From 1815 to 1848 Austria, although she no longer could claim the nominal authority which had been hers as head of the Holy Roman Empire, exercised a strong influence in Germany as president of the German Diet, and was largely concerned in all the movements of Europe through the policy of Metternich and the Holy Alliance (See METTERNICH, Clemens Wenzel Nepomuk Lothar). Her policy was consistently reactionary, and she steadily combated all tendencies towards national feeling in Germany. In 1848, however, when the revolutionary spirit was rife in Europe, Austria found herself called on to subdue revolts on every side. A popular uprising took place in Vienna; Metternich was forced to resign, and the government was compelled to admit a free press and the right of citizens to bear arms. In Italy, too, occurred revolts, and the Austrians were driven out of Venice, where their rule had long been felt to be unendurably irksome. The most serious difficulty, however, was found in Hungary, where the rebellion was put down only after the abdication of Emperor Ferdinand in favor of his nephew, Francis Joseph, and the formation of an alliance with Russia. A more vigorous policy was now pursued, and the movement in Venice was crushed in 1849. The emperor found himself obliged to proclaim a constitution in Austria, but he was strong enough to make it a constitution of his own formation, with little of the liberal character which had been demanded in the risings of the year before.

Austria's next move of great and lasting importance was the attempt to suppress the growing national feeling in Italy. Especially were these efforts directed against Sardinia, which was prepared to resort to arms to drive Austria out of Italy. Sardinia, however, gained the alliance of France, and, by her victories at Magenta and Solferino, obliged Austria to give up her hold on Lombardy. In 1866 occurred another crisis in the affairs of the Empire. Bismarck had drawn Austria into the struggle with Denmark for the possession of Schleswig and Holstein, and after the successful outcome of this conflict, the possession of the two duchies was the occasion of war between Austria and Prussia (See SEVEN WEEKS' WAR). The defeat of Austria in this struggle resulted in her entire loss of influence in Germany. Robbed of her position of importance as head of the German Confederation, she found that to maintain her integrity she must make concessions in her internal government. The Hungarians, whose demands for a greater degree of self-government had never entirely ceased, finally succeeded in forcing from Austria the *Ausgleich*, which settled the relations of Austria and Hungary on their present basis (See *Government*, above). This arrangement, while far less galling to the Hungarians than the previous state of affairs, has never entirely satisfied them, and recently there have been outbreaks which show that the desire for independence among them is by no means dead. In Bohemia, too, the Czechs have shown a constant opposition to the rule of Austria, and though concessions have been made toward a self-government for Bohemia, the question is far from settled.

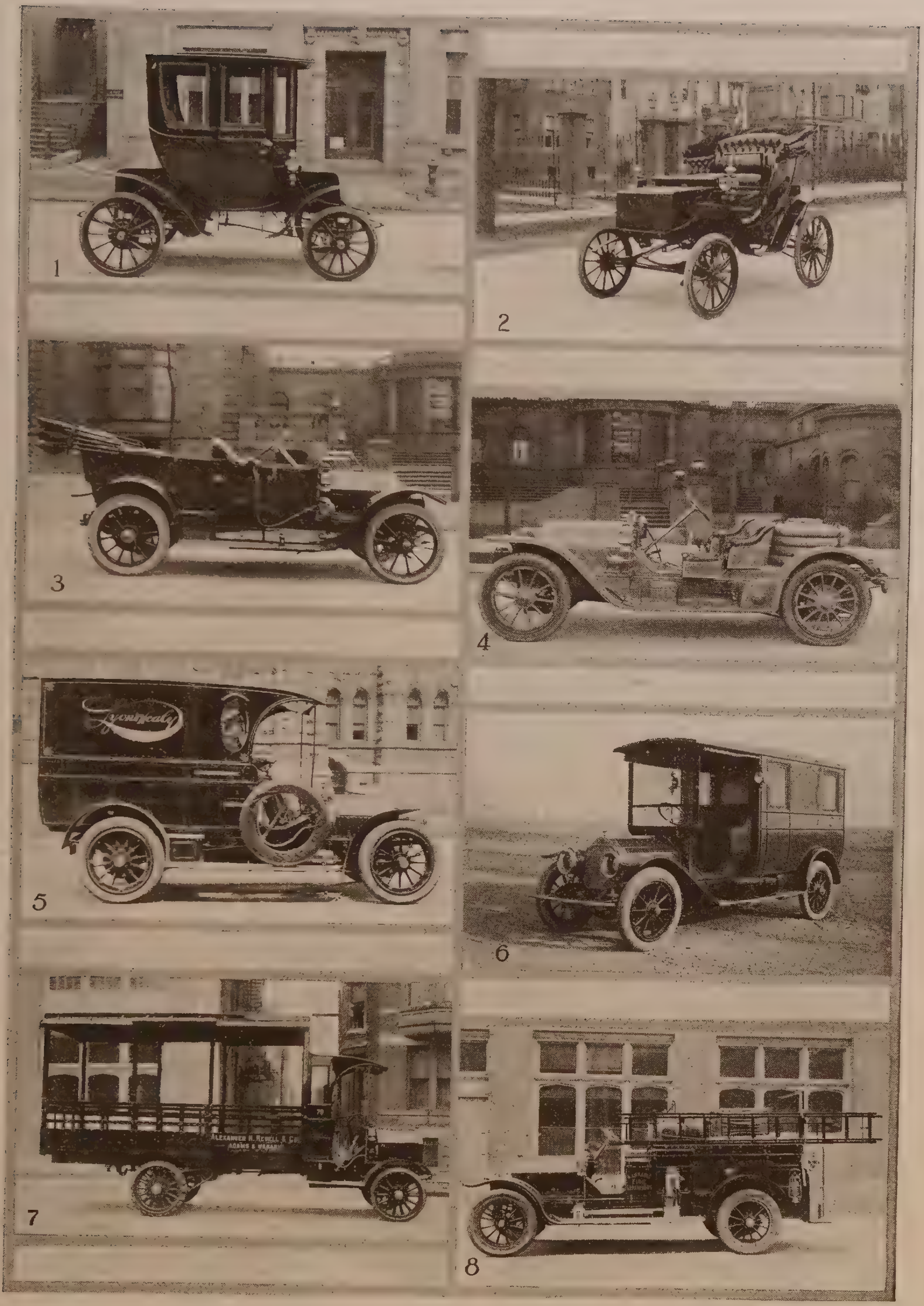
Aus'trian Succession, War of the. See Succession Wars, subhead *War of the Austrian Succession.*

Auto da fe, *ow'to dah fa,* originally the announcement of the sentence passed by the Inquisition against heretics, but later and more commonly applied to the execution of such a sentence by burning at the stake. When an execution was to take place a great crowd of spectators gathered to witness it, and a procession of priests and monks preceded the execution. If the accused made profession of the Catholic faith, he was allowed to be strangled before being burned. Otherwise, he was fastened alive to the stake.

Autom'aton, a mechanism which represents a living animal figure in action. Mechanisms of this sort have been known for many years, and during the sixteenth and seventeenth centuries were much more common than at the present time. Representations of men playing upon musical instruments, as the flute, flageolet and drum, of ducks which could swim and dive, and various other figures attracted wide attention during this period and showed remarkable skill and patience on the part of their inventors. One of the most common uses of such figures was in connection with clocks (See Strassburg Clock). In its broadest sense the term now means any machine which, upon being started, will perform a certain series of acts by itself; hence, the term *automatic* is applied to many labor-saving machines, such as those used in typesetting, in watch making, and in the manufacture of pins.

Automo'bile, the name which is popularly applied to all forms of self-propelling vehicles, used upon highways and streets for general freight and passenger service. Wagons, carriages, omnibuses, touring-cars, run-abouts, heavy vehicles for trucking freight and other road conveyances driven by steam, electricity, petroleum, gasoline or naphtha are classed as automoblies, provided they do not require tracks for their operation. The automobile proper is a development of comparatively recent date, though as early as 1680 Sir Isaac Newton invented a toy horseless carriage which embodied all the essential features of a steam automobile. In England and France several model steam carriages were constructed during the eighteenth century, and in the United States Oliver Evans suggested the use of steam road-wagons to the Lancaster Turnpike Company of Maryland. But it was not until the nineteenth century that any important results in road machines were obtained. In 1827 Walter Hancock, an Englishman, patented what was then a remarkable boiler, and finally succeeded in applying it successfully to a three-wheeled vehicle which he called the *Automaton.* In this a vertical engine was placed near the middle of the vehicle and drove a chain-wheel with a chain-driver extending back to the rear axle. The *Automaton* ran regularly for twenty weeks as a coach between Stratford, Paddington and Islington, carrying over 12,000 passengers during this period. At about the same time that Hancock invented his boiler, another Englishman, David Gurney, constructed and operated successfully a self-propelling carriage with a water-tube boiler and horizontal engine. This machine made a record of eigthy-five miles in ten hours. Contemporary with Hancock and Gurney, several other inventors made valuable improvements on steam vehicles. But by 1836 all practical continued effort in the development of the horseless carriage had ceased, and was never resumed to any extent until more than fifty years later.

The period of modern development of the automobile began in 1894, when a Frenchman, M. Leon Serpollet, applied his instantaneous generator or boiler, invented in 1889, to a motor vehicle. This boiler is of the water-tube type (See Boiler). The steel tubes are enclosed in a rectangular covering of two thicknesses of iron, with asbestos packed between them. The fuel used is vaporized oil. Just above and surrounding the burner is a coil of round pipe. This coil receives the water and passes it into the series of water-tubes, from which the steam and water pass into twisted flat tubes. These tubes deliver the steam immediately to the engine. In the modern Serpollet automobiles four-cylinder engines are used, with the cylinders arranged in pairs. Most of the



LEADING TYPES OF AUTOMOBILES

1. Electric Coupé.
2. Electric Runabout.
3. Touring Car—Fore Door Type.
4. Racing Car.
5. Delivery Wagon
6. Ambulance.
7. Truck.
8. Fire Patrol.

European motors are modeled after that of Serpollet.

Next to France, the chief development of the steam automobile has been in the United States. Some American machines have water-tubes, but many of these of standard make have fire-tubes of copper or steel, surrounding a cylindrical upright boiler. Gasoline is generally used as a fuel and is vaporized by special burners. Automatic feed-pumps, operated from the engine, usually supply water to the boiler.

Gasoline and electric automobiles came into use about the same time as the steam vehicles. The gasoline vehicles are very popular and are manufactured in many varieties. The motive power in these vehicles is given to the piston by the explosion of vaporized oil. By the successive explosions power is transmitted to a crank-shaft, from which it is led off by a chain-drive or gearing to the driving shaft. Other oil vehicles, as petroleum and naphtha automobiles, are constructed on the same principle.

The standard automobile car is a touring car of 24 to 28 horse-power weighing from 2000 to 2500 pounds, though larger cars having 30 to 35 horse-power and proportionately heavier are found. The motors for these cars usually have four cylinders and are placed in front and covered by a hood or bonnet. The power is transmitted through a gear which usually meshes into a bevel gear on the rear axle. Some machines are propelled by a chain and sprocket wheel in a manner similar to the bicycle, though this is not common for the heavier and more powerful machines. The wheels are from 32 to 34 inches in diameter and have pneumatic tires 4 to 4½ inches in diameter. These cars will carry four or six people, and under ordinary conditions will traverse long distances at the rate of 12 or 15 miles per hour over good roads. Where the roads are rough a lower rate of speed must be maintained. Cars are manufactured in a great variety of styles and patterns, to suit the tastes of different customers.

The electric automobile came into use in France and America at about the same time as the gasoline automobile. The electric carriages at once found great favor because of the ease with which they can be operated and because of their freedom from noise and disagreeable odors; but it was soon found that they were not suitable for heavy work or for traveling long distances, because the motive power had to be supplied through a storage battery, and in order to secure a battery furnishing sufficient power for a long distance the weight would be so great as to load the machine down with almost its capacity for transportation. Again, these batteries could not be charged except as they were brought in contact with dynamos, and if one became exhausted on the road the automobile must be hauled to the nearest electric station before power could be supplied. By continuous experiment, however, the storage battery has been greatly improved, so that now a battery of much lighter weight contains a larger supply of electricity, and machines have been made in France which stored sufficient electricity to enable them to travel from 60 to 130 miles. United States electric carriages have made successful trips of 100 miles with one charge. These results show that the electric automobile has been greatly improved, and with this improvement its use will become widely extended.

The use of the automobile as a vehicle for regular transportation and for the purpose of carrying freight in cities has become thoroughly established. Cars are now made so durable that they withstand long trips over rough roads, several trips between the Atlantic and the Pacific coast having been successfully made within a reasonable time. Like the bicycle, when it first came into general use the automobile was regarded as a vehicle of pleasure and sport. Automobile races in the United States and Europe, especially in France, are common, and in some of these remarkable rates of speed have been maintained. In a contest held in Paris in 1903, the winner covered a distance of 331.2 miles in 5 hours and 13½ minutes. But it is as a vehicle of business that the automobile is to be more highly valued. Motor cars, drays and trucks are now common in all cities of the United States, and the extended use of the automobile is exerting a strong influence in securing better roads throughout the country.

The manufacture of automobiles has become an important industry, in which France and the United States take the lead. For a time automobiles were imported from France in quite large numbers, but American manufacturers were soon able to supply the home demands, and now nearly all automobiles used in the United States are of American manufacture.

Au′toplasty, the surgical operation which consists in taking a piece of tissue from a healthy body and using it to supply the deficiency caused by deformity, disease or wounds. Harelip, injuries from scalds, burns or mutilations, or lesions caused by skin diseases, are treated in this way. Skin is the agent most frequently employed and can be taken from the patient's body or that of some other person. Autoplasty was practiced in India centuries ago, but it was not until late in the nineteenth century that the transplanting of skin was successfully practiced by Western physicians.

Au'tumn, the season of the year between summer and winter. Astronomically speaking, in the Northern Hemisphere this season covers the period from the autumnal equinox, about September 22, till the winter solstice, December 22. Popularly, however, in America the term autumn is used to denote the months of September, October and November; and in England, to denote August, September and October.

Av'alanche, a large mass of snow or ice that slides down a mountain. Avalanches are of different forms; those consisting of fine, dry particles of snow driven down the mountain by a strong wind are known as *wind* or *dust avalanches*; those which consist of great masses of snow sliding down a slope by their own weight are known as *sliding avalanches*; those which are detached by heat from the high glaciers are known as *glacier* or *summer avalanches*. The sliding avalanche is the most dangerous of all, and consists of vast accumulations of snow set free from above, which increase in force as they descend, overthrowing houses, tearing up trees, burying villages and swallowing up forests, cattle and human beings. Avalanches are sometimes of immense size; two which fell in the Alpine districts of Italy, in 1885, contained 45,000 and 250,000 tons of snow respectively.

Ave Maria, *ah'va mah ree'ah*, (Hail, Mary), the first two words of the angel Gabriel's salutation to Mary (*Luke* I, 28), and the beginning of the very common Latin prayer to the Virgin in the Roman Catholic Church. Its lay use was sanctioned at the end of the twelfth century, and a papal edict of 1326 ordains the repetition of the prayer thrice each morning, noon and evening, at the hour indicated by the bells called the Ave Maria or Angelus Domini.

Aver'nus, a lake now called Lago d'Averno, in Campania, Italy, between the ancient Cumae and Puteoli, about eight miles from Naples. It occupies the crater of an old volcano, and is in some places 180 feet deep. Formerly the gloom of its forest surroundings and its sulphurous vapors caused it to be regarded as the entrance to the infernal regions. It was the fabled abode of the Cimmerians, and was especially dedicated to Proserpine.

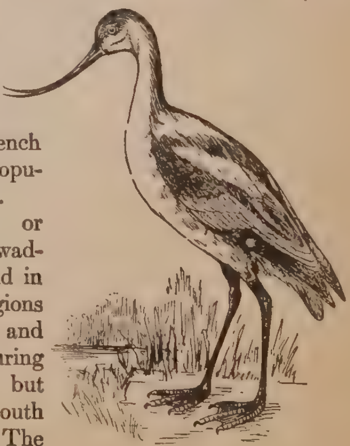
Aves'ta. See Zend-Avesta.

A'viary, a building or enclosure for keeping, breeding and rearing birds. The custom of establishing aviaries has been prevalent in all countries since the times of the early Greeks and Romans, and in England we know that they were in use as early as 1577. At the present date, in all of the zoölogical gardens of Europe and America there are fine aviaries. New York, Washington, Boston, Chicago and other American cities have buildings of this sort, and fine collections of birds are maintained at public expense.

Avicenna, *av'e sen'nah*, or **Ebn-Sina** (980–1037), an Arabian philosopher and physician. At the age of twenty-one he wrote an encyclopedia of the sciences, but of his one hundred works the best known is the *Canon Medicinae*, which was in use as a text-book at Louvain and Montpellier in the middle of the seventeenth century.

Avignon, *a ve nyoN'*, an old town of southeastern France, capital of the department Vaucluse. It is an archbishop's see and has an ancient cathedral on a rock overlooking the town and an immense palace in which the popes resided, now used as barracks. Silk manufacture and the rearing of silkworms are the principal employments in the district. After its purchase by Pope Clement VI in 1348, Avignon and its district continued to be the property of the papal see till 1791, when it was formally united to the French Republic. Population, 41,007.

Av'ocet or **Av'oset,** a wading bird found in temperate regions of Europe and America during the summer, but migrating south in winter. The bill is long, slender, elastic and bent upward toward the tip. The legs are long, the feet webbed, and the plumage, which is generally light, is varied with black on the wings and brown on the head,



AVOCET

neck and breast. In the western states the avocet is considered a good game bird. It feeds in the marshes, where, with its sensitive beak, it scoops up the worms and small crustaceans from the mud.

Avogadro's Law, *ah'vo gah'drose,* a principle advanced in 1811 by Avogadro, an Italian scientist. This principle asserts that equal volumes of different gases at the same pressure and temperature contain an equal number of molecules.

Avoirdupois, *av'ur du poiz',* (from old French words meaning *goods of weight*), a system of weights used for all goods except precious metals, gems and medicines. In this system a pound contains 16 ounces, or 7000 grains.

A'von, the name of several smaller rivers in England, of which the most famous rises in Northamptonshire, flows past Shakespeare's birthplace, Stratford, and falls into the Severn, after a course of 96 miles.

Ax, a steel tool used in felling trees and chopping wood. The thick part of the ax is called the head and contains the eye, into which the handle is driven. The blade of the common ax is wedge-shaped and has a curved edge from five to six inches long and in line with the handle. The handle, also called the helve, is from two and one-half to three feet long, and is for use with both hands. The shape of the ax varies in different countries, but the common American pattern is considered the best. A hatchet is a small ax with a short handle, to be used in one hand. It is used in shingling and lathing. A broadax has a chisel-shaped edge and a wide blade. It was formerly used in hewing timber. The largest factory in the world for manufacturing axes is at Collinsville, Conn.

Ax'iom, a self-evident truth; specifically, in mathematics, certain fundamental relations which are so plain that they require no proof and upon which all processes are based. Among these are the following: (1) that equal quantities added to equal quantities produce equal quantities; (2) that a whole is greater than any of its parts. See ALGEBRA.

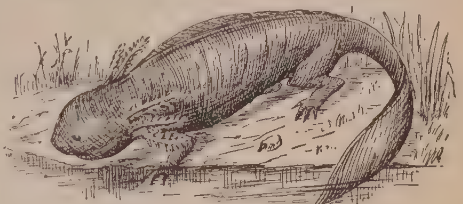
Ax'is, the straight line, real or imaginary, passing through a body or magnitude, on which it revolves, or may be supposed to revolve; for instance, the *axis of the earth,* the imaginary line drawn through its two poles.

In botany the word is also used, the stem being termed the *ascending axis,* the root the *descending axis.*

In anatomy the name is given to the second vertebra from the head, that on which the *atlas* moves.

In mathematics an axis is the straight line about which the parts of a figure or body are symmetrically arranged.

Ax'olotl, a larval salamander, living in the lakes about Mexico. The young have bushy external gills similar to those of the mud puppy. A remarkable fact about these salamanders is that they remain permanently in the larval condition and never are transformed into adults. One species, the *black Mexican axolotl,* is highly valued as food by the Mexicans.



AXOLOTL

Aye-Aye, *i-i,* an animal of Madagascar, so called from its cry, belonging to the lemur family. It is about the size of a hare, has large, flat ears, a bushy tail, large eyes and long, sprawling fingers, the third so slender as to appear shriveled. In color it is musk-brown, mixed with black and gray ash. It feeds on grubs and fruits, and in its habits it is nocturnal.

AYE-AYE

Ayeshah, Aysha, or **Aisha,** *a'e shah* or *i' shah,* daughter of Abu-bekr and favorite wife of Mohammed. After his death she opposed the succession of his son-in-law, Ali.

Ayr, a town in Scotland situated on the river Ayr, 34 mi. s. w. of Glasgow. The modern town is well laid out and has good buildings and paved streets. The most important structures are the churches, the town hall, the county buildings, the academy, free library and railway station. The leading industries are shipbuilding, tanning and the manufacture of carpets, lace curtains and boots and shoes. Ayr is on a good harbor at the mouth of the river and has quite an extensive commerce, exporting iron, coal and manufactured goods. Within a mile and a half of the town is the birthplace of Robert Burns and the Alloway church. Population in 1901, 28,624.

Aza'lea, a genus of plants belonging to the heaths, remarkable for the beauty and fragrance of their flowers and distinguished from the rhododendrons chiefly by the flowers having five stamens instead of ten. Many beautiful rhododendrons whose leaves fall once a year are known under the name of *azalea* in gardens. Azaleas are common in North America. An Asiatic species, famous for the stupefying effect which its honey is said to have produced on Xenophon's army is also common in gardens and shrubberies, and another is a brilliant greenhouse plant.

Azincourt, *ah zhaN koor'*. See AGINCOURT.

Azo'ic Era, the earliest division of geologic time, extending to the Protozoic Era. As used by most geologists, it means the same as the Archaean System. See ARCHAEAN SYSTEM; GEOLOGY.

Azores, *a zorz'*, or **Western Islands,** a group of islands belonging to Portugal, in the North Atlantic Ocean. They are nine in number and form three distinct groups: the northwest, consisting of Flores and Corvo; the central, consisting of Terceira, Sao Jorge, Pico, Fayal and Graciosa; and the southeast, consisting of Sao Miguel (Saint Michael) and Santa Maria. Sao Miguel, Pico and Terceira are the largest. The islands are volcanic and subject to earthquakes, and are conical, lofty, precipitous and picturesque. The most remarkable summit is the peak of Pico, about 7600 feet high. There are numerous hot springs. The Azores are covered with luxuriant vegetation, and have many different woods, besides corn-fields, vineyards, lemon and orange groves and rich open pastures. The mild and somewhat humid climate, combined with the natural fertility of the soil, brings all kinds of vegetable products rapidly to perfection. The prosperity of these islands is hindered by the lack of good harbors. The Azores were discovered by Cabral about 1431, shortly after which date they were taken possession of and colonized by the Portuguese. When first visited they were uninhabited, and had scarcely any animals except birds, particularly hawks, called in Portuguese *acores*, to which the islands owe their name. Population, 256,475.

Azov, *a zof'*, SEA OF. an arm of the Black Sea, with which it is united by the Strait of Kertch. Its length is about 170 miles, its breadth about 80 miles and its greatest depth not more than 8 fathoms. The western part, called the Putrid Sea, is separated from the main expanse by a long sandy belt called Arabat, along which runs a military road. The sea teems with fish. The Don and other rivers enter it, and its waters are very fresh.

Az'tec, a race of people who settled in Mexico and ultimately extended their dominion over a large territory, and were still growing under their most celebrated ruler, Montezuma, at the time of the arrival of the Spaniards, by whom they were speedily subjugated, in the early part of the sixteenth century. They had a considerable knowledge of agriculture, maize and the agave being the chief products. In metal work, feather work, weaving and pottery they possessed a high degree of skill. To record events they used hieroglyphics, and their lunar calendars were of unusual accuracy. Two special deities claimed their reverence, the god of war, propitiated with human sacrifices, and Quetzalcoatl, the beneficent god of light and air, with whom at first the Aztecs were disposed to identify Cortez. Their temples, with large terraced pyramidal bases, were in the charge of an exceedingly numerous priesthood, with whom lay the education of the young. See INDIANS, AMERICAN, subhead *Mexican and Central American Indians*; MONTEZUMA; CORTEZ, HERNANDO.

AZTEC WARRIORS

Az'urite, a crystallized copper carbonate, usually found in copper ores. It is found near Lyons, France, in Siberia and in Arizona. When occurring in large quantities and uncrystallized, it is used as a source of copper. Some varieties are cut into slabs and used for table tops, and others, especially those found in the mines of Arizona, are highly esteemed as gems. It is azure blue in color. It takes a high polish and presents a beautiful appearance.

B

B is the second letter and the first consonant in the English and in all other alphabets which are derived from the Phoenician. It is pronounced solely by the lips, and is distinguished from *p* by being produced by the utterance of voice as well as breath. In related languages it is often found that a *b* in one language is replaced by a *p* in another, especially when it occurs in a terminal position. In music, B is the seventh note of the diatonic scale, or scale of C. It is called the leading note, as there is always a feeling of suspense when it is sounded until the keynote is heard.

Baader, *bah'dur,* Benedict Franz Xavier von (1765–1841), a German Roman Catholic philosopher and theologian born in Munich. He was fitted for civil engineer and practiced that profession for a number of years, though during his school career and afterwards he manifested unusual interest in philosophy. He was the discoverer of the use of glauber's salt, in place of potash, for making glass. In 1826 he was appointed professor of philosophy and speculative theology in the new University of Munich. Twelve years later he came into prominence by his open opposition to the interference of the Catholic Church in civil matters, and because of this he was forbidden to lecture on philosophy of religion. He did not believe in the papacy and desired to have it abolished. Notwithstanding his conflict with the higher authorities of the Church, he is considered one of the greatest philosophers and theologians of his day.

Baal, *ba'al,* or **Bel,** a Hebrew and Semitic word signifying *lord,* and applied to many different divinities. In *Hosea* II, 16, it is applied to Jehovah himself, while Baal-berith (the Covenant-lord), was the god of the Shechemites, and Baal-zebub (the Fly-god) the idol of the Philistines. There were as many Baals as there were towns.

Baalbek, *bah'lbek,* a ruined city of Syria, situated near the foot of Antilibanus, 40 mi. n. w. of Damascus. In ancient times Baalbek was a city of considerable importance and is supposed to have contained a population of at least 200,000. The name signifies *city of Baal.* The place is now of interest because of its extensive ruins. The most ancient ruin is that of the Temple of the Sun, which was a rectangular building 290 feet long and 160 feet wide, having its roof supported by 54 Corinthian columns, 19 on each side and 10 at each end. The circumference of these columns is about 22 feet and their length 50 feet, but, with the pedestal, capital and entablature, they had a height of 85 feet. The ruins of this structure exhibit work remarkable not only for its magnitude but for the nicety of its execution. Some stones used in the great platform of the temple are over 60 feet long and 12 feet thick. These are laid side by side and are so nicely fitted together that their joints are not easily seen. South of the Temple of the Sun is found a temple of Jupiter, which is probably of more recent origin. The present town is an insignificant village of about 2000 inhabitants.

Bab'bitt Metal, a soft metal resulting from melting together certain proportions of copper, tin and zinc or antimony, and used with the view of obviating friction as far as possible in the bearing of journals, cranks and axles. Babbitt metal was invented by Isaac Babbitt, a goldsmith of Boston, Mass., from whom it takes its name.

Bab'cock, Orville E. (1835–1884), an American soldier, born in Franklin, Vt. He graduated at West Point and served during the whole of the Civil War, for a time as aide-de-camp to General Grant. He later became private secretary to President Grant, and in 1876 he was indicted for complicity in the Whisky Ring frauds, but was acquitted.

Ba'bel, Tower of, a structure in the plain of Shinar, Mesopotamia, which, according to the eleventh chapter of *Genesis,* was commenced by the descendants of Noah, subsequent to the deluge. The tower of Babel has commonly been identified with the great temple of Belus (or Bel), one of the chief edifices in Babylon, and the huge mound called Birs Nimrud is generally regarded as its site, though another mound, which to this day bears the name of Babil, has been assigned by some as its site. Babel means literally *gate of God*, and is not derived from the word meaning *confusion*.

Bab-el-Mandeb, *bahb'el mahn'deb* (gate of tears), a strait between the Indian Ocean and the Red Sea, formed by projecting points of Arabia, in Asia, and Abyssinia, in Africa. Its width is 15 miles at its narrowest part. The island of Perim is located in the strait.

Bab'ington, Anthony (1561–1586), an English gentleman, remembered only for his share in the plot against Queen Elizabeth for supposed complicity in which Mary Queen of Scots was put to death. Babington, with the other conspirators, was executed before Mary was.

Babirussa or **Babyrussa,** *bab i roo'sa,* a wild hog which inhabits Celebes and other East Indian islands. It is an active animal, with a nearly naked skin, and does not root in the ground as do other members of its family. The upper canine teeth do not grow downward, but upward, through openings in the skin on each side of the snout, and they curve backward nearly to the eyes.

BABIRUSSA

Babism, *bahb'izm,* the name of the doctrine of a religious sect in Persia, founded by Muhammad ibn Radhik about 1843. The sect takes its name from Muhammad's self-styled title of Bab-ud-Din. The doctrines are pantheistic and opposed to the strict Mohammedan faith. The Babists believe that all individual existence comes from the supreme deity. They attach great importance to the number 7 and to the number 19, which they consider to represent the deity. They consider Christ, Moses and Mohammed as prophets, but forerunners of the Bab, and inferior to him. They prohibit polygamy and recognize the equality of the sexes to a much greater extent than the Mohammedans, and because of their opposition to the Mohammedans they are persecuted by the followers of that sect.

Baboon, *bab oon',* a common name applied to a division of old-world apes and monkeys. They have long, abrupt muzzles like a dog, strong tusks or canine teeth, usually short tails, cheek-pouches and small, deep eyes, with large eyebrows. Their hind and fore feet are well proportioned, so that they run easily on all fours, but they do not maintain themselves in an upright posture with facility. They are generally of the size of a moderately large dog, but the largest, the mandrill, is, when erect, nearly of the height of a man. They are almost all confined to Africa and are ugly, sullen, fierce and gregarious, defending themselves by throwing stones, dirt and the like. They live on fruits and roots, eggs and insects. The *chacma* or *pig-tailed baboon* is found in considerable numbers in parts of the South African colonies, where the inhabitants wage war against them on account of the ravages they commit in the fields and gardens. In color they are grayish black, or wholly black. The *common baboon,* of a brownish yellow color, inhabits a large part of Africa farther to the north. The *hamadryas* of Abyssinia is characterized by long hair, forming a sort of shoulder cape. See Mandrill; Ape; Monkey.

Bab'ylon, the capital of Babylonia, once one of the largest and most splendid cities of the ancient world. It was a royal city sixteen hundred years before the Christian era; but the old city was almost entirely destroyed in 689 B. C. A new city was built by Nabopolassar, and it was under him and his successor, Nebuchadnezzar, that

DOG-FACED BABOON

Babylon reached the height of its glory. This later Babylon covered about fifty square miles and was in the form of a square, with walls of such immense height and thickness as to constitute one of the wonders of the world. It contained splendid edifices and pleasure grounds; the "hanging gardens," a sort of lofty terraced structure supporting earth enough for trees to grow, and the celebrated tower of Babel, or temple of Belus (See BABEL, TOWER OF). After the city was taken by Cyrus it began to decline, and had suffered severely by the time of Alexander the Great. Discoveries have been made, on its site, of numerous and valuable inscriptions in the cuneiform or arrowhead character. See BABYLONIA.

Babylo'nia. GEOGRAPHY. Babylonia was an ancient district of Mesopotamia, included between Assyria and Susiana on the north, the Persian Gulf on the south, the Tigris on the east and the Arabian Desert on the west. According to the Babylonian inscriptions, the district consisted of several divisions, the northern part being known in the earliest days as Akkad, or Accad, and the southern part as Shumar, or Shinar. The term Babylonia is derived from Babylon, the name of the capital of the district, and is applied in the Old Testament to the whole country. The surface is an alluvial plain, formed in great part through deposits by the river. At one time the plain was covered with a network of canals and was very fertile, but it is now a cheerless waste.

PEOPLE. The Babylonians were a quick-witted, commercial people, fond of letters and other peaceful pursuits. Their language closely resembled that of the Hebrews and Phoenicians It was written in cuneiform characters, first on papyrus leaves and later on clay tablets (See CUNEIFORM INSCRIPTIONS). In bulk the remains of the literature are immense, and consist largely of hymns, prayers, omens and incantations, but include, also, epics, myths, legends and historical works. There are also works on science, agriculture and commercial law, which show that some important progress had been made along these lines. The system of government was a pure despotism, with viceroys ruling the provinces under the king, who dwelt in luxurious seclusion from his people. The worship of the dead played a prominent part in the Babylonian religion.

ART. In Babylonia, architecture as a fine art was first practiced. The material used was sun-dried bricks, and the tools used in building were very simple. As the land was flat, the buildings were erected on high platforms of brick, reached by stairways. Statues, both standing and seated, carved basins and low reliefs show that the Babylonians practiced sculpture in more varied forms than the Assyrians, but, probably owing to their lack of stone, they never attained to the skill of their neighbors.

HISTORY. The date of the settlement of Babylonia is unknown, nor is it known positively whence the ancient Babylonians came. From the cuneiform inscriptions it appears that the first settlers were Semites who came from the upper Tigris-Euphrates region. These people mingled with the Aryans and Caucasians, and by 4000 B. C. they had reached a high state of culture. Detailed information concerning the history of Babylonia begins about 2300 B. C., with King Hammurabi, who united all the southern states of Mesopotamia under his power and placed the seat of government at Babylon. About 1900 B. C., or earlier, began the colonization of Assyria by the Babylonians. Once established, Assyria grew to be a rival of the parent state, and wars between the two nations were almost constant. From about 1782 B. C., Babylonia was ruled for over five centuries by a people known as the Kassites, who came from Media. During the next two hundred fifty years, no less than four changes in dynasties took place, native Babylonians alternating with Kassites. In 1026 B. C. a native ruler came to the throne. But about this time Assyria began to interfere in Babylonian affairs, and in 710 B. C. Sargon II, a powerful king of Assyria, reduced Babylonia to an Assyrian province, although its final subjugation was not effected until 638 B. C., when Sargon's son Sennacherib destroyed Babylon. Less than one hundred years later, when the Assyrian power began to wane, the Babylonians, incited by Nabopolassar of Chaldaea and aided by a horde of Medes under Cyaxares, revolted and, marching into Assyria, took and destroyed Nineveh. Nabopolassar then established the new Babylonian kingdom, about 626 B. C. His son, Nebuchadnezzar, ruling from about 604–561 B. C., was the most powerful monarch who ever sat on the Babylonian throne. He conquered Jerusalem and Tyre and ravaged Egypt along the shores of the Mediterranean. Moreover, he raised Babylon to its highest degree of splendor and power. Nebuchadnezzar was succeeded by a line of weak kings, and the country was in a constant state of turmoil until 538 B. C., when

Cyrus the Great captured Babylon. After this Babylonia was a Persian province until, with the conquest of Alexander the Great it passed under Greek control and then into the hands of the Parthians. After Alexander's death the country was neglected, and owing to the perishable quality of the building materials, the cities soon were in ruins. See BABYLON; ASSYRIA.

Bab'ylo'nish Captiv'ity. See JEWS.

Bacchus, *bak'kus* (Dionysus), the god of wine, son of Jupiter and Semele. He first taught the cultivation of the vine and the preparation of wine. In art he is represented usually as naked, but sometimes he has an ample mantle about his shoulders or a fawnskin across his breast. He is often accompanied by Silenus, Bacchantes or satyrs. The Bacchanalia, the feasts periodically held in his honor, were so licentious that they were abolished by the Roman Senate in 187 B. C. Bacchante was the name given generally to a female taking part in such feasts and processions.

Baccio della Porta, *bah'cho del'lah por'tah.* See BARTOLOMMEO, FRA.

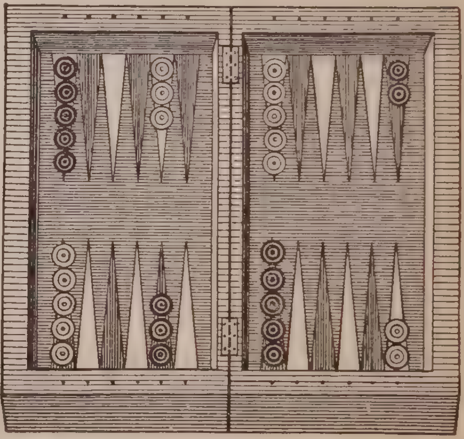
Bach, *bahK,* JOHANN SEBASTIAN (1685–1750), one of the earliest and greatest of German musicians. Descended from a long line of musicians, he was early trained in the art and soon distinguished himself. In 1703 he was engaged as a player at the court at Weimar and subsequently held an appointment at Leipzig. As a player on the harpsichord and organ he had no equal among his contemporaries; but it was not till a century after his death that his greatness as a composer was fully recognized. His compositions include studies for the organ, piano, stringed and keyed instruments; church cantatas; oratorios; masses, and passion music. It is as a composer for, and performer upon, the organ that his fame is most secure, and especially through his fugues, which are considered the most perfect ever written. More than fifty musical performers have proceeded from this family. Bach was the father of twenty-one children, and all of his eleven sons were distinguished as musicians.

Bach'eller, IRVING (1859–), an American novelist, born at Pierpont, N. Y. He graduated at Saint Lawrence University and was connected successively with the *Daily Hôtel Reporter* of New York, the *Brooklyn Times,* the *Pocket Magazine* and the *New York World.* Before 1900 he also wrote for periodicals, published two books and conducted a syndicate for supplying magazines with literary material. His *Eben Holden, D'ri and I* and *Darrel of the Blessed Isles,* each with a setting near his early home, achieved a success which was not increased by a later novel, *Vergilius,* picturing Rome at the beginning of the Christian era.

Bach'elor's But'tons, a name given to the double-flowering buttercup, with white or yellow blossoms, and to the common blue cornflower, as well as to several different species.

Bacillus, *ba sil'lus,* the name applied to certain minute, rod-like organisms, forming one of the three principal classes of bacteria which often appear in putrefactions. One bacillus is believed to be the cause of tubercles in the lung, and is thought to be present in all cases of consumption. See BACTERIA.

Back'gammon, a game played by two persons upon a double table, or board, made for the purpose. Each end of each side of the board has six points colored alternately red and black. Each of the two players has fifteen "men" or checkers. Two dice are used, and the throw from these determines the number of the point on which a man can be placed; or, after all have been placed, the number of points it can be moved onward or the point from which it can be thrown off in the fourth section. The game is won by the player who first moves all men from point to point around the table and throws them off from the last section. At any time when a point holds two men it is covered, and the other player is unable to put a man upon it. If only one man is on a point, the opponent may remove it if one of his men can be placed upon that point, in which case the man removed must be entered and played around again. Neither player can move for-



BACKGAMMON BOARD

ward until all his men are entered on the first section; nor can he throw off until all men are upon the last section.

Ba'con, a kind of salted and smoked meat prepared from the sides and back of the hog. The name is also given to hams and shoulders that have been pickled and smoked. Bacon is usually dry-salted and then smoked. The best quality is cut into very thin slices and packed in sealed tin cans. It is highly prized as an article of food.

Bacon, AUGUSTUS OCTAVIUS (1839–), an American lawyer and politician, born in Brian co., Ga. He entered the Confederate army, and at the close of the Civil War became one of the leading lawyers of his state. He entered politics, was several times candidate for the Democratic nomination for governor of Georgia and was for many terms a member of the lower house of the state legislature. He was elected United States senator in 1895 and was reëlected in 1901.

Bacon, FRANCIS (1561–1625), a great English philosopher, statesman and jurist. He was knighted, made Baron Verulam and in 1621 viscount of Saint Albans. When he was a boy, Queen Elizabeth asked him how old he was. He gave the courtly reply, "Two years younger than your majesty's happy reign." He was admitted to the bar when twenty-one years old, entered Parliament at thirty-four, filled various legal offices, and in 1618 was created lord high chancellor. He was accused of corruption as a judge and pleaded guilty to the charge. He was fined $200,000 and sentenced to the Tower during the king's pleasure. Subsequently his punishment was practically remitted, though not till he had suffered the full measure of disgrace. Not one of his decrees was ever reversed as unjust.

Bacon's principal title to renown is in his development of the inductive method of reasoning, of which Aristotle was the father. He undertook to rearrange the whole system of human knowledge, and though his self-appointed task was too great for him, yet he contributed more to real scientific progress than any other man since the days of the Greek philosophers. The illness of which he died was contracted while he was engaged in an experiment with snow, an experiment whose success has led to the cold storage systems of to-day. The *Novum Organum* was his most pretentious work. His *Essays*, fifty-eight in number, treating of a great variety of subjects, are as bright, as fresh, as applicable to life, as when they were written. They are so full of meaning, so condensed in style and so logical in arrangement, that they repay the closest study.

Bacon, JOSEPHINE DASKAM (1876–), writer of fiction, was born at Stamford, Conn., and graduated at Smith College. She contributed poems and stories to the *Atlantic Monthly* and other magazines. Among her books are *Smith College Stories, The Madness of Philip, Middle Aged Love Stories* and the *Memoirs of a Baby.*

Bacon, LEONARD (1802–1881), an American clergyman, born in Detroit, Mich. He graduated at Yale in 1820, and in 1825 was ordained pastor of the First Congregational Church of New Haven, which pastorate he held until his death. He was professor of didactic theology in Yale, 1866–1871. Dr. Bacon edited *The Christian Spectator*, wrote for *The New Englander* and founded and edited *The Independent* (1847).

Bacon, NATHANIEL (1648–1676), an English colonist, chiefly famous as the leader of Bacon's Rebellion in Virginia. He was born in England and was a distant relative of the great Lord Bacon. He was educated as a lawyer, emigrated to Virginia in 1673, and there he rose to prominence as a land-holder and leader. Because of Governor Berkeley's refusal to proceed against the indians, Bacon was chosen by the colonists to lead an independent force and succeeded in putting down a serious uprising in 1675. This led to Bacon's Rebellion. See BACON'S REBELLION.

Bacon, ROGER (1214–1294), an English monk, and one of the most profound and original thinkers of his day. He first entered the University of Oxford and afterward that of Paris, where he received the degree of Doctor of Theology. About 1250 he returned to England, entered the order of Franciscans, and made researches in physics, which led his ecclesiastical superiors to charge him with practicing "black art," or magic. He was sent to Paris and kept in confinement for ten years. Having been set at liberty, he was again thrown into prison (1278), where he remained for at least ten years. His most important work is his *Opus Majus*, in which he discusses the relation of philosophy to religion, and then treats of language, metaphysics, optics and experimental science. He was well versed in geography and astronomy and invented the magnifying glass.

Bacon's Rebellion, a rebellion of colonists in Virginia in 1676, under the leadership of Nathaniel Bacon, against the colonial government headed by William Berkeley. The chief causes of the incident were unequal taxation, enforcement of the navigation laws and Governor Berkeley's vacillating attitude toward the indians. The last named was the immediate occasion for the outbreak. Bacon, being refused a commission to fight the indians, organized a force of his own, and returning from the frontier, defied the authority of the governor. Bacon died suddenly of a fever, and the rebellion soon collapsed, but Berkeley executed a number of those who had been prominent in the affair.

Bacte′ria and **Bacte′riol′ogy.** Bacteria are minute one-celled vegetable organisms, which multiply by transverse division. They are spherical, oval, rod-like or spiral in shape and of exceedingly small size — some being less than 1–30,000th of an inch in diameter. They may be divided into two groups, according to the source from which they obtain nutriment: the *saprophytes,* who live on dead organic matter, and the *parasites,* who live upon living organisms. The saprophytic bacteria are beneficial, for by their aid dead bodies are dissolved into their original elements and made good for higher plants and animals. In fact, existence without them would not long be possible (See PUTREFACTION). Some bacteria attach themselves to the roots of plants and furnish them with food. Others are used in making acids, cheese and butter, and in many other processes. All fermentation is of bacterial origin (See FERMENTATION). With the parasites, on the other hand, the conditions are different. Through their activities there is constantly a loss to both the animal and vegetable kingdoms. They rob the organism in which they live of substances it needs to keep it healthy, and at the same time they form substances that are directly poisonous to the tissues in which they are growing. Some bacteria flourish in an atmosphere of oxygen, while to others the presence of this gas is a detriment, and this fact gives rise to another classification.

The principal forms of bacteria are three in number:

(1) The *micrococcus* is a small, oval or round body which grows and multiplies in various ways, so that individuals are found growing in large bunches, in long chains, in fours, in squares, cubes and so on, according to the species. The most common of the micrococci are the pus microbes, golden, lemon-colored and white.

(2) The *bacillus* is a minute rod-shaped organism that varies as to length, breadth and thickness in the different species. The bacilli of consumption and of typhoid are common examples.

(3) The *spirillum* is a minute spiral or comma-shaped germ, which in some species presents letter S curves and in others resembles a bacillus. An example of this form is the spirillum of Asiatic cholera.

An important feature of certain bacteria is their power of spore formation, a process by which an organism is enabled to enter a state in which it resists influences opposed to its growth. It is this property which renders certain germs so harmful, as in this state they resist chemical and physical agents that easily destroy life, even withstanding the action of a temperature of 212° F. for several hours. The bacillus of anthrax is a good example of this. Certain bacteria possess the power of moving about. The propelling power is composed of hair-like appendages, called flagellae, projecting from various parts of the body-wall. This power is possessed preëminently by the bacillus of typhoid.

Bacteria are found everywhere, and they multiply so rapidly that it has been estimated that one bacillus in twenty-four hours will produce sixteen and a half millions.

By their growth bacteria produce certain poisons, called *ptomaines* and *tox-albumins.* This action is the cause of the numerous deaths reported from eating ice cream, sausage, fish and other substances, and of several common diseases (See ANTISEPTICS; GERM THEORY OF DISEASE; MEDICINE).

Bacteriology treats of the character, growth and products of bacteria, of their effects upon humanity, especially as the causes of disease. In order to study bacteria they are placed in a flask containing a nourishing material, which is absolutely free from other germs. The nutritive material, gelatin, bouillon, potato, blood serum or whatever it is, must be adapted to the specific bacterium, for not all flourish equally well in any medium.

After the preparation of the medium, it must be made perfectly sterile. This is accomplished by submitting it to the action of live steam for half an hour on three successive days. The object of this "fractional sterilization" is to kill the successive crops of spores as they develop.

When the medium has been properly prepared, a portion of a substance containing the bacteria to be studied is placed with the medium in a flask where it can be kept from contamination, and is submitted to a gentle heat until a growth of the bacteria can be seen. Small quantities of these are put into other sterilized flasks and the process repeated until finally all the bacteria but the species wanted have been left behind and the desired one grows alone. The bacteria are now studied under the microscope until their form and habits are known and their species is identified. Finally, if the bacteria are thought to be disease-producing, an animal, usually a guinea pig or a rabbit, is inoculated, and if the animal falls ill with the disease which existed where the original specimens came from, the germ is known to be the real cause of the disease.

Through such a laborious process was the bacillus of consumption separated, identified and made known to the world by Koch.

In many cities, laboratories are established for the protection of public health, and in these specific cases are studied after the general method described above, but varied to suit the conditions. Water is examined for indications of typhoid danger; cases of suspected diphtheria, tuberculosis, cholera and other diseases are critically studied and preventive measures advocated.

The study of bacteriology may be said to have had its beginning with the observations of Leeuwenhoek in the year 1675. In this year he published the fact that he had seen, by means of a lens of his own construction, living, moving animalcules in a drop of rain water. Extending his work to the examination of sea water, well water, the contents of the intestinal canal of frogs, birds and other animals, he found objects that differed in size, shape and peculiarity of movement. From a study of his work it is known that he had discovered what are now known as bacteria. The work of Rindfleisch, Klebs, Orth, Eberth and others, shows a gradual advance, and with Koch, in 1881, bacteriology as a science was firmly established.

Bac'tria or **Bactrian'a,** a country of ancient Asia, south of the Oxus and reaching to the west of the Hindu Kush. The land included in Afghanistan and Asiatic Russia, known to-day as the province of Balkh, was formerly Bactria. It is often regarded as the original home of the Aryan people. A Graeco-Bactrian kingdom flourished about the third century B. C., but its history is obscure. In the early years of the Christian era Bactria was the center of Buddhism.

Badajoz, *bah'da hose',* a town, the fortified capital of the Spanish province of the same name, 132 mi. e. of Lisbon and 5 mi. from the frontier of Portugal. Among the important buildings are a ruined Moorish castle, the fortifications, an old cathedral and a large granite bridge across the Guadiana. The manufactures include soap, woolens and leather. In 1811 Badajoz was taken by Marshal Soult, and it was stormed by Wellington April 6, 1812. Population in 1900, 30,899.

Badeau, *ba do',* ADAM (1831–1895), an American soldier, born in New York. He served on General Sherman's staff and later on General Grant's, and retired with a brigadier general's brevet in the regular army. From 1869 to 1881 he was secretary of legation and consul general at London, and he accompanied General Grant on his trip around the world. He published *Military History of Ulysses S. Grant* and *Grant in Peace.*

Baden, *bah'den,* a town of Austria, 15 mi. s. w. of Vienna. It is especially noted because of its hot sulphurous springs, used both for bathing and drinking. In 1840 Baden was made a city. It is generally known as Baden Bei Wien. Population in 1900, 17,000.

Baden, or **Baden-Baden,** to distinguish it from other towns of the same name, a town and watering-place in the grand duchy of Baden, 18 mi. s. w. of Karlsruhe. It is built in the form of an amphitheater, at the edge of the Black Forest. Baden has been celebrated from the remotest antiquity for its thermal baths, which are recommended for the treatment of gout, rheumatism and diseases of the skin and kidneys. The town has many good buildings and a castle, the summer residence of the grand duke. The principal industry is wood-carving. Population in 1900, 15,700.

Baden, GRAND DUCHY OF, the fourth state in size, and the fifth in population, of the German Empire. It has an area of 5824 sq. mi. It is traversed to a considerable extent by the lofty plateau of the Black Forest, which attains its highest point in the Feldberg, 4904 feet. The principal minerals worked are coal, iron, zinc and nickel. The number of mineral springs is remarkably great, and of these not a few are celebrated. The agricultural interests are important, and the products include wheat, oats, barley, rye, potatoes, hemp, tobacco, wine and sugar-beets. Baden is also famous for its fruits and for its fine wines. Among the important manufactures are textiles, tobacco and cigars, chemicals, machinery, jewelry, pottery ware wooden clocks (confined chiefly to the region of the Black Forest) and musical instruments.

The capital is Karlsruhe, about 5 miles from the Rhine, and other chief towns are Mannheim; Freiburg-im-Breisgau, with a Roman Catholic university; Baden, with its warm mineral springs, known and used in the time of the Romans, and Heidelberg, having a university founded in 1386, the oldest in the present German Empire (See HEIDELBERG, UNIVERSITY OF).

In the time of the Roman Empire Southern Baden was a part of the province of Rhaetia, which belonged to the Romans. Under the old German Empire it was a military district under the control of a marquis, which in 1533 was divided into Baden-Baden and Baden-Durlach, but was reunited in 1771. The title of grand duke was conferred upon the ruler by Napoleon in 1806, and in the same year Baden was extended to its present limits. In 1871 it became a member of the German Empire. Population in 1900, 1,866,584.

Ba'den-Powell, ROBERT STEVENSON SMYTH (1857–), a British soldier, who began his military career with the army in India, afterwards serving in Afghanistan and South Africa. He acquired distinction as commander of the native troops in Ashantee in 1895, and later in the Matabele campaign. He was in command of the British forces besieged in Mafeking during the South African War, and succeeded in repelling his assailants until he was relieved. Because of his success in defending the place he was promoted to be major general.

Badger, *baj'ur,* a carnivorous mammal, allied both to the bears and to the weasels, different species being found in Europe and America. The badger has short, thick legs, and long claws on the fore feet. The common badger is about the size of a dog, but much lower on the legs with a flatter and broader body, a very thick, tough hide and long, coarse hair. It inhabits the north of Europe, Asia and America, is indolent and sleepy, feeds by night on vegetables and small quadrupeds, and burrows in the ground. Its flesh may be eaten, and its hair is used for artists' brushes in painting. "Badger baiting," or "drawing the badger," was a barbarous sport formerly practiced. A badger was put in a barrel, and one or more dogs were put in to drag him out. When this was effected he was returned to his barrel, to be similarly assailed again. From this cruel sport came the word *badgering,* which means *worrying.* The American badger belongs to a separate genus. It has a brownish color, and its head is striped with white. Wisconsin is called the badger state.

BADGER

Bad Lands, the name given to certain lands which, by reason of the absence of natural vegetation, have been greatly eroded by the rains and have been formed into hills and valleys of all sizes. The term is applied specifically to a region in the United States which lies at the upper part of the Missouri drainage basin, partly in South Dakota and partly in Nebraska.

Baeda, *be'dah.* See BEDE.

Baf'fin, WILLIAM (1584–1622), an English navigator, famous for his discoveries in the Arctic regions. In 1616 he ascertained the limits of the inlet afterwards known as Baffin's Bay. He was killed at the siege of Ormuz, while aiding the Persians in an attempt to drive out the Portuguese.

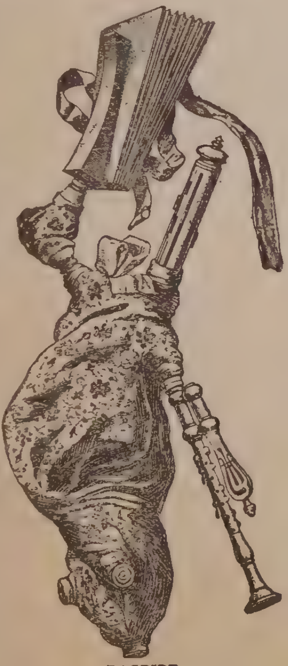
Baf'fin's Bay, a large gulf in the northeast of North America, bounded on the east by Greenland. It is about 850 miles long, and its greatest width is 400 miles .The shores are rocky and high. This bay was named in honor of William Baffin, who explored it in 1616. It is largely an ice sea and is blocked almost solid with ice in the winter.

Bagatelle, *bag a tel',* a game played with spherical balls and a cue, on a long, flat board covered with cloth like a billiard-table. At one end of the board are nine cups or sockets of just sufficient size to receive the balls, which are driven from the other end by the cue. Nine balls are used, generally one black, four white and four red, the distinction between white and red being made only for the sake of variety. In ordinary use the word *bagatelle* means any trifling thing.

Bagdad, *bag dahd',* the capital of a Turkish province of the same name, in the southern part of Mesopotamia. The manufactures are leather, silks, cottons, woolens, carpets and ornamental fabrics. Steamers ply on the river between Bagdad and Bassorah, and the town exports wheat, dates, galls, gum and carpets to Europe. The city is inhabited by Turks, Arabs, Persians, Armenians, Jews and a small number of Europeans. Bagdad was formerly a great center of Arabian learning and one of the most flourishing cities of the world. It was founded in 762. In 1258 it was sacked by a Mongol ruler and since 1638 has been held by the Turks. It has been frequently visited by the plague, and in 1831 was nearly devastated. Population, estimated, over 150,000.

Bagehot, *baj'ot,* Walter (1826–1877), an English journalist and economist, born in Somerset. He graduated from University College, London, with high honors, in 1848. He was admitted to the bar four years later, but did not practice. From 1855 to 1864 he was associate editor of the *National Review,* and from 1860 until his death he was editor and joint proprietor of *The Economist.* He was the author of numerous economic and political works, notably *The English Constitution* and *Physics and Politics.*

Bag'pipe, a musical wind-instrument of very great antiquity, having been used among the ancient Greeks. It still continues in use among the country people of Poland, Italy, France, Scotland and Ireland. Though now often regarded as the national instrument of Scotland, it is only Scottish by adoption, having been introduced into that country from England. It consists of a leathern bag and of pipes, into which the air is pressed from the bag by the performer's elbow. In the common, or Highland, form one pipe, called the *chanter,* plays the melody; of the three other pipes, called *drones,* two emit a monotone in unison with one of the lowest notes of the chanter, and the third and longest gives forth a note an octave lower.


BAGPIPE

Baha'ma Islands or **Lucayos,** a group of British West Indian islands lying n. e. of Cuba and s. e. of the coast of Florida. They are formed largely of windblown coral sand. The principal islands are Grand Bahama, Great Abaco, Little Abaco, Andros Islands, New Providence, Eleuthera, Great Exuma, San Salvádor, Acklin's Island and Great Inagua. Twenty of the whole group are inhabited, and the most populous is New Providence, which contains the capital, Nassau. The principal product is pineapples, which form the chief export, though other fruits are also grown, as well as cotton, sugar, maize and ground nuts. The agave, from which the sisal hemp is obtained, nearly covers the surface of some of the islands. The Bahamas are a favorite resort for invalids suffering from pulmonary diseases. The first British settlement was made on New Providence towards the close of the seventeenth century. San Salvador or Watling Island is thought by some authorities to be the same as Guanahani, the land first touched on by Columbus in 1492. Population, in 1901, estimated at 53,735.

Bahia, *bah e'ah,* or **São Salvador,** *sowN sal'va dor,* a town of Brazil, on the Bay of All Saints, capital of the province of Bahia It was founded in 1549 and is the oldest town in Brazil, of which it was capital until 1763. Bahia is well supplied with churches and has beautiful buildings, the more important of which are the governor's palace, the mint, the courthouse, the university, the cathedral and the palace of the archbishop. The harbor is one of the best in America, and the trade, chiefly in sugar, cotton, coffee, tobacco, hides, piassava and tapioca, is very extensive. Population in 1900, estimated at 200,000.

Bahia Honda, *one'da* (deep bay), a seaport on the northern coast of Cuba, 60 mi. w. s. w. of Havana. It is one of the best harbors on the island and is protected by a small fort. Near by are mines of coal and copper. Population, about 1300.

Baiae, *bi'e* (now called Baga), an ancient town in Italy in Campania, 10 mi. w. of Naples. It was famed among the Romans as a watering place and was noted for its warm springs and baths. Many of the wealthy Romans had country houses at Baiae. The city became notorious for the luxury and the dissolute life of its inhabitants. With the fall of Roman power it lost its importance, and it is to-day the site of innumerable ruins.

Baikal, *bi kahl'*, a lake in southern Siberia, the largest fresh water lake in Asia. Its length is 375 miles, greatest breadth 37 miles and greatest depth over 4000 feet. It is surrounded by rugged and lofty mountains. There are seals and many fish, particularly salmon, sturgeon and pike; the seal and sturgeon fisheries are important industries. This lake is frozen over from December to April.

Bail, in law, property pledged as security for a person under arrest, in order that he may have his liberty until trial. Bondsmen must be citizens of the state, holders of real estate and within reach of the processes of the court, and they must be financially responsible to the amount of the bail. The person may be rearrested on the complaint of the bondsmen, and thereupon their responsibility ceases. A person accused of murder or held to enforce the judgment of a court cannot be released on bail.

Bailey, *ba'ly,* JAMES MONTGOMERY (1841–1894), an American journalist. He edited the *Danbury News,* to which he contributed humorous articles and sketches which for a time had great vogue. He was known as "The Danbury News Man."

Bailey, JOSEPH WELDON (1863–), an American statesman, born in Copiah co., Miss. He was admitted to the bar in 1883 and removed to Texas in 1885, beginning the successful practice of law at Gainesville. He attained prominence as a Democratic politician and from 1891 to 1901 represented his district in Congress, being honorary nominee of his party for speaker and the leader of the minority in the House. He was elected United States senator in 1901 and became an acknowledged leader of the Democrats of that body.

Bailey, PHILIP JAMES (1816–1902), an English poet. His most important poem, *Festus,* was published in 1839, and it gained at once a remarkable popularity in England and in America. The extravagant estimate of Bailey's genius formed on the appearance of this poem has been considerably modified.

Baily's Beads, a phenomenon attending eclipses of the sun, the unobscured edge of which appears discontinuous and broken immediately before and after the moment of complete eclipse.

Bain, ALEXANDER (1818–1887), an English educator and psychologist, born at Aberdeen, Scotland, and educated at Marischal College. He began his career as teacher of moral and natural philosophy in Marischal College and afterwards held numerous positions of importance. In 1857 he was appointed examiner in logic and moral philosophy at the University of London. He was also examiner in moral science for the India civil service and later professor of logic and English literature in the University of Aberdeen, of which institution he was chosen lord rector in 1881. Doctor Bain was one of the foremost thinkers and writers of his day upon his favorite topics. He was a leader in the school of psychologists who developed the science from the physiological point of view (See PSYCHOLOGY), and by his lectures and writings he was very influential in molding psychological and educational thought in England and the United States. Among his many works, those best known in this country are *The Emotions and the Will, The Relation of Mind and Body* and *Mental and Moral Science.*

Bain'bridge, WILLIAM (1774–1833), an American naval officer. He served for years in the merchant marine, and when the United States navy was reorganized in 1798 he was appointed lieutenant commandant. In 1800 he commanded the frigate *George Washington,* which carried to Algiers the commercial tribute then levied by the dey of that country, and in 1801 he was captain of the *Essex,* which cruised in the Mediterranean. During the war with Tripoli, he commanded the frigate *Philadelphia* under Commodore Preble, and while chasing a blockade-runner his vessel grounded on a reef and was obliged to surrender. The captain and his three hundred men were kept as prisoners until the peace, in June, 1805. He sailed from Boston in 1812, in command of a squadron comprising the *Constitution, Essex* and *Hornet,* and late in the year he captured the British frigate *Java,* for which achievement Congress distributed among the crew $50,000 as prize money, voted the commodore a gold medal and gave each of his officers a silver one. In 1815 Bainbridge commanded the Mediterranean squadron.

Bairam, *bi rahm'*, the Easter of the Mohammedans, which follows immediately after Ramadan, a month of fasting, and lasts three days. Sixty days after this first great Bairam begins the lesser Bairam.

Baird, SPENCER FULLERTON (1823–1887), an American naturalist, born at Reading, Pa., and educated at Dickinson College, Carlisle, Pa., and at the College of Physicians and Surgeons in New York City. He early exhibited a taste for natural history, and during his school life became acquainted with Agassiz, Audubon and other leading zoölogists. After teaching for a time he was made assistant secretary of the Smithsonian Institution and succeeded Doctor Joseph Henry as secretary. During Mr. Baird's connection with this institution, he supervised much of the work of exploration in the western portion of the United States, founded the National Museum, which was developed under his direction, and as the first Commissioner of Fish and Fisheries in the United States developed the system of fish culture now in general use throughout the country (See FISH CULTURE). Baird was a prolific writer for periodicals and edited for a number of years the reports of the Smithsonian Institution and of the United States Fish Commission. Among his most noted works are *Birds of America*, *History of American Birds* and *Mammals of North America*.

Baireuth or **Bayreuth,** *bi'roit,* a town of Bavaria on the Red Main, 41 mi. n. e. of Nuremberg. The principal buildings are the old and the new palace, the opera house and the gymnasium. The place is especially famous for the national theater, finished in 1875, which is used for the performance of Wagner's music (See WAGNER, WILHELM RICHARD). A monument to the memory of Jean Paul Richter stands in Baireuth. The principal industries are cotton-spinning, sugar refining, manufacture of musical instruments and brewing. Population in 1900, 29,000.

Ba'ker, EDWARD DICKINSON (1811–1861), an American soldier, born in England. He moved to America in 1816, began the practice of law at Springfield, Ill., and became a member of the Illinois legislature in 1837. He was elected to Congress in 1844, but resigned to enter the army and served during the Mexican War. At its close he was again elected to Congress for one term. In 1851 he settled in San Francisco and was soon the recognized leader of the state bar. Later he went to Oregon and was elected United States senator. In the Civil War he commanded a regiment of New York and Philadelphia volunteers and was killed at Ball's Bluff while making a charge.

Baker, SIR SAMUEL WHITE (1821–1893), a distinguished English explorer. In 1861 he began his travels in the Upper Nile regions, which resulted in the discovery of Albert Nyanza and of the exit of the White Nile from it. In 1869 he returned to the interior of Africa as head of an expedition sent by the khedive of Egypt to annex and open up to trade a large part of the newly explored country, and he was raised to the dignity of pasha. His writings include *The Rifle and the Hound in Ceylon*, *Eight Years' Wanderings in Ceylon*, *The Albert Nyanza* and *Cast up by the Sea*.

Baker City, ORE., the county-seat of Baker co., is on the Oregon Railroad and Navigation Line, 357 mi. e. of Portland. It is an important distributing point. It is also the center of the Blue Mountain mining district, which has the largest annual output of gold in the state. The Powder River valley and adjacent smaller valleys produce large crops of cereals, fruit, hay and vegetables. The chief industries include lumber mills, flour mills and foundries. Excellent public and private schools are maintained. Population in 1910, 6742.

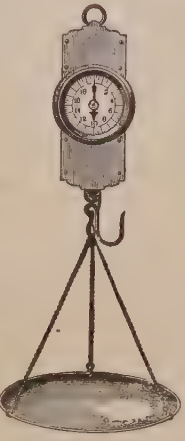
Bak'ing Pow'der, a mixture of cream of tartar, soda and starch, or flour. Baking powder is used in raising bread, biscuit and other preparations of flour or meal. The starch or flour serves to keep the cream of tartar and soda from acting upon each other, until the powder is wet. The principle of baking powder is that when wet, the cream of tartar attacks the soda and sets free carbonic acid gas. This passes through the dough and causes it to rise and become light and porous. Baking powder is liable to be adulterated with alum and ammonia, both of which are injurious, and some states carefully regulate the manufacture of baking powder by law. The alum can be detected by dissolving the powder in cold water. If the water does not foam, alum is present. Ammonia can be detected by dissolving a small quantity of the baking powder in water and boiling. If ammonia is present, the odor can be detected in the steam.

Baku, *ba koo',* a Russian port on the western coast of the Caspian Sea. The city includes a strange combination of ancient, oriental and modern structures. Petroleum is found in the vicinity and the annual production now exceeds nine million tons. The mining and refining of this oil is the leading industry; other important industries are the manufacturing of tobacco and chemicals. A considerable trade is carried on in cotton, silk, rice and wine. Baku has long been the place of pilgrimage for the Parsees or Fire-worshipers. The port is a station of the Caspian fleet and is strongly fortified. Population, 112,250.

Ba'laam, a heathen seer, invited by Balak, king of Moab, to curse the Israelites, but compelled by a miracle to bless them (*Num.* XXII–XXIV). In another account he is represented as helping to lead the Israelites to worship Baal, and as being, therefore, slain in the Midianitish war (*Num.* XXI; *Joshua* XIII).

Balaklava, *bah la klah'vah,* a small port on the Black Sea, in the southwest of the Crimea. In 1854, during the Crimean War, the town was occupied by the British under Lord Raglan. Here the troops suffered great privations, many perishing with hunger and cold. On October 25 occurred the Battle of Balaklava, between the Russians and British. The daring but unsuccessful charge of the British cavalry in this battle has been immortalized by Tennyson in his poem, *The Charge of the Light Brigade.*

Bal'ance, a device for weighing substances. The simplest form of balance consists of a horizontal bar resting upon a pivot which passes through the center of the bar and is supported by an upright standard. The arms of the horizontal bar must be of equal size and weight. Directly over the point of support is a vertical needle which moves over a disk graduated in degrees. The *scale pans,* which are two shallow circular pans, are suspended from each end of the bar. Such a balance, when carefully made, is a very delicate instrument and will indicate the weight of a grain of sand. The best balances are usually kept enclosed in glass cases to protect them from dust and corrosion from the atmosphere. They are used in weighing drugs and other substances which require great accuracy in the weighing.


SPRING BALANCE

The common spring balance used in grocery stores and meat shops consists of a scale pan attached to a spring. An indicator on the spring passes over a graduated scale, showing the weight of the article placed in the scale pan. Spring balances are suitable for ordinary commercial purposes, but they are not exact, hence cannot be used in weighing substances of great value or for determining the weight of small quantities of anything. See STEELYARD; WEIGHING SCALE.

Balance of Power, a political principle which first came to be recognized in modern Europe in the sixteenth century, though it appears to have been also acted on by the Greeks in ancient times in preserving the relations between their different states. The object in maintaining the balance of power is to secure the general independence of nations as a whole, by preventing the aggressive attempts of individual states to extend their territory and sway, at the expense of weaker countries. The first European monarch whose ambitious designs induced a combination of other states to counteract them was the emperor Charles V, and similar coalitions were formed in the seventeenth century, when the ambition of Louis XIV excited the fears of Europe. A century later the nations combined against the exorbitant power and aggressive schemes of the first Napoleon. More recent still is the Crimean War, entered into to check the ambition of Russia (See CRIMEAN WAR). It was, too, the violation of the principle by Russia, in her attempts to gain power in the East, which led to the Russo-Japanese War.

Balaton, *bol'a ton,* or **Plattensee',** a lake of Hungary, 55 mi. s. w. of Budapest. In length it is 50 miles, and in breadth 3 to 10 miles. Of the thirty rivers flowing into it, the Zala is the largest, and the lake communicates with the Danube by the rivers Sio and Sarviz.

Balbo'a, VASCO NUNEZ DE (1475–1517), one of the early Spanish adventurers in the New World. Having dissipated his fortune, he came to America, and was at Darien in 1510. An insurrection placed him at the head of the colony, and he immediately began a search for a rumored western ocean. On Sept. 25, 1513, he saw for the first time the Pacific. Returning to Darien, he found himself supplanted by a new governor. Anger and jealousy at once arose on both sides, but Balboa submitted. Davila, the new governor, apparently became reconciled to him, and gave him his daughter in marriage, but shortly after had him beheaded on a charge of intent to rebel. Pizarro, who afterward completed the discovery of Peru, served under Balboa.

Balch, *bawlch,* GEORGE BEALL (1821–), an American naval officer. He entered the navy in 1837, was many years on foreign service and participated in the attack on Vera Cruz. He served in the South Atlantic squadron during the Civil War, commanding in turn the *Pocahontas* and the *Pawnee.* In 1878 he was made rear admiral, and he was placed on the retired list in 1883.

Balder, *bawl'dur,* in Northern mythology, the son of Odin and Frigga, the personification of the sun and of the brightness of summer. For his beauty and goodness he was beloved by all of the gods except the wicked Loki, who was determined to accomplish his destruction. Balder's mother, fearful for his life, obtained from all things in the world, with the exception of a little spray of mistletoe which grew upon an oak tree, a promise that they would not injure Balder. It became, therefore, a favorite sport of the gods to hurl their most dangerous weapons at him in order to see them fall harmless. Loki, however, fashioned a dart from the mistletoe, which he put into the hand of Balder's blind brother, directing him how to throw it. The dart struck Balder and he fell dead.

Bald'ness, loss of the hair, complete or partial, usually the latter, and due to various causes. Most commonly it results as one of the changes belonging to old age. It may occur at an unusually early age, as a result of some acute disease, or without any such cause. In both the latter cases it is due to defective nourishment of the hair, owing to lessened circulation of the blood in the scalp. The best treatment for preventing loss of hair seems to consist in such measures as bathing the head with cold water and drying it by vigorous rubbing with a rough towel and brushing it well with a hard brush. Various stimulating lotions are also recommended. Probably in most cases baldness of old age is unpreventable. When extreme scurfiness of the scalp accompanies loss of the hair, an ointment that will clear away the scurf will prove beneficial.

Bald'win, the name of several members of the House of Flanders, who ruled in Jerusalem during the Crusades. Baldwin I became king of Jerusalem on the death of his brother Godfrey de Bouillon in 1100. He left an enlarged and strengthened kingdom to his successor, Baldwin II, who reigned from 1118 to 1131. Tyre was taken during his reign and the Order of the Templars was founded. Baldwin III, who reigned from 1142 to 1162, took Ascalon, but lost Edessa. He was a strong and just ruler, much beloved by his subjects. The reigns of Baldwin IV and Baldwin V were unimportant.

Baldwin, CHARLES H. (1822–1888), an American naval officer, born in New York City. He entered the navy in 1839, became a lieutenant in 1853, commander in 1862 and captain in 1869. He served in the Mexican War, and during the Civil War he was in command of one of the steamers of the mortar flotilla, when Farragut's fleet passed Forts Saint Philip and Jackson in 1862, and when the attack was made on Vicksburg in June, 1862.

Baldwin, MATTHIAS W. (1795–1866), an American inventor, born in New Jersey. He is given credit for having constructed the first locomotive in America, the *Ironsides,* and for making several improvements in locomotives.

Balearic, *bal e ar'ik,* **Isles,** a group of islands situated southeast of Spain and including Majorca, Minorca, Iviza and Formentera. Their combined area is 1935 square miles. Their products are similar to those of Spain and Portugal. The islands now form a Spanish province. The capital is Parma, on Majorca. In the thirteenth century they constituted an independent kingdom, which was finally united with Spain. Population, about 311,650.

Baleen'. See WHALEBONE.

Balfe, *balf,* MICHAEL WILLIAM (1808–1870), a British musician, born in Dublin. When only sixteen he conducted the orchestra at Drury Lane Theater, London. He afterward studied in Italy, and in 1845 he was made conductor of the Italian Opera, Covent Garden, London. His principal works are operas, the best-known of which are *The Bohemian Girl* (1844) and *The Rose of Castile* (1857).

Balfour, *bal foor',* ARTHUR JAMES, Rt. Hon., (1848–), a noted British statesman. He was educated at Eton and Trinity College, Cambridge, and in 1874 was returned to Parliament as Conservative member for Hertford. In 1886 he was returned from Manchester. Public attention was soon drawn to him by his quickness of perception and readiness in debate, and he became one of the most effective speakers in the House. From 1878 to 1880 he was private secretary to his uncle, Lord Salisbury, whom he accompanied to the Congress of Berlin. He was appointed president of the Local Government Board in 1885, secretary for Scotland in 1886 and chief secretary for Ireland in 1887. His brilliant administration while in this position, at the time one of the most difficult in the British cabinet, won him the praise of all parties. In 1892 he became first lord of the treasury and leader of the House. With the exception of the brief interval when the Liberals were in power he held this position until July, 1902, when, on the resignation of Lord Salisbury, King Edward appointed him premier and asked him to form a cabinet. The Liberal victory of 1906 removed Mr. Balfour's party from power.

Mr. Balfour is the author of *The Foundations* *of Belief* and *The Defense of Philosophic Doubt,* works which have attracted much favorable attention.

Balfour, JOHN HUTTON (1808–1884), a distinguished Scotch botanist. He established the Botanical Society of Edinburgh, was professor of botany in Glasgow University and a fellow of the Royal Society. He was for thirty years dean of the medical faculty of the University of Edinburgh. Among his valuable botanical works are *Outlines, Elements* and *Manual.*

Bali, *bah'le,* one of the East Indian Islands, situated east of Java. Its greatest length is 85 miles, its greatest breadth 55 miles and its area 2260 square miles. The island is of volcanic origin and the surface is high and broken, the loftiest peak attaining an elevation of 11,326 feet. The most important products are rice, coffee, cocoa, indigo and cotton. The island is divided into eight provinces, each of which is under a native rajah. Its general administration is under the Dutch. Population, estimated at 700,000.

Baliol, *ba'le ol* or *bal'yol,* JOHN DE (1249–1315), king of Scotland. On the death of Margaret, granddaughter of Alexander III Baliol claimed the vacant throne by virtue of his descent from David, earl of Huntington, brother to William the Lion. Robert Bruce, a descendant of David by another line, opposed Baliol; but Edward I's decision was in favor of Baliol, whom he induced to swear allegiance to him. Irritated by Edward's harsh exercise of authority, Baliol concluded a treaty with France, then at war with England, but after the defeat at Dunbar he was obliged to give up his crown to Edward. He was sent with his son to the Tower, but in 1297 obtained liberty to retire to his Norman estates, where he died.

Balize, *ba leez'.* See HONDURAS.

Balkan, *bal kahn',* **Mountains** (ancient Haemus), the most eastern branch of the great Alpine system of central Europe, extends from the plain of Sophia to the Black Sea, separating Bulgaria from eastern Rumelia, and forming the watershed between the Danube and the Maritza. In the central Balkans are the highest summits, several of which are over 7000 feet high. The mountains are crossed by six roads over as many passes, the most important of which is the Troyan, which forms the overland route between Vienna and Constantinople.

Balkash, *bahl kahsh',* or **Tenghiz,** a salt lake in Russian Central Asia, having an area of 8500 square miles. Its length is 330 miles, and its width varies from 6 miles in the eastern portion to 54 miles; its depth nowhere exceeds 80 feet. The northern shores are low and marshy and the fisheries are unimportant.

Ball. Ball-playing was practiced by the ancients, and old and young amused themselves with it. The Greek damsels are represented in the *Odyssey* as playing ball to the sound of music, and Horace represents Maecenas as amusing himself thus in a journey. In the Greek gymnasia, in the Roman baths and in many Roman villas, a place was appropriated for playing ball, the games being not altogether unlike those of the present day. In the Middle Ages the sport continued very popular both as an indoor and outdoor exercise, and was a favorite court pastime until about the end of the eighteenth century. In England football and tennis are mentioned at an early date. See BASEBALL; BASKETBALL; CRICKET; FOOTBALL; GOLF; HANDBALL, LAWN TENNIS· POLO.

Ball, THOMAS (1819–) an American sculptor, born in Charlestown, Mass. He studied in Europe, and in 1865 settled in Florence, Italy. Among his works are the equestrian statue of Washington at Boston, the Webster statue in Central Park, New York, and the Emancipation group at Washington, D. C.

Bal'lad, a term loosely applied to various poetic forms of the song type, but in its most definite sense, a poem in which a short narrative is related. The ballad is probably the oldest form of poetic expression, and it was, in fact, the simple beginning of the epic, which was often formed by the fusion of a number of ballads. As in the case of the folk tales, the ballads of different nations resemble one another so often and so closely that it is probable that many of them had a common origin. The ballads had no single author, and they were handed down orally, thus changing greatly as time went on; but the fact that they belonged to no one person more than to all others kept them simple narratives into which little subjective emotion was introduced. The themes with which they dealt—love, hatred, fear, crime, superstition, war or death—were such as to render them well-nigh universal in their appeal.

It is evident from references of various writers that among the Germanic nations the ballad developed very early, and it appears that Charlemagne had many ballads written down as a means of education. Nothing of these early songs remains, however, and their character can be known only from such longer works as the *Nibelungenlied*, a conglomerate, to a large degree, of old ballads. By the middle of the twelfth century the ballad had attained great popularity in Germany, and not until the sixteenth century did this popularity wane. From this latter date, however, until the publication of Percy's *Reliques*, little attention was paid to the ballad in Germany; but during the nineteenth century it was an object of great interest and of much literary study. The ballads of England and Scotland, while there are extant no manuscripts earlier than the fifteenth century, were probably much older than this. We have, in fact, indications by various authors that the ballads of Robin Hood, for example, were common in the thirteenth century. The Scottish ballads are much more vigorous in their expression and much less artificial than those of southern England, and this is perhaps due to the fact that while the northern ones continued to be handed down orally, those of the south were put into print early and were given many thorough revisions, which took away much of their natural character.

Among British ballads the most famous, perhaps, are the series known as the *Gest of Robin Hood, Sir Patrick Spens, The Twa Corbies, Fair Helen of Kirkconnel Lea* and *Clerk Saunders.* In the eighteenth century the publication of Percy's *Reliques of Ancient English Poetry* gave a great impetus to interest in the ballad, and several other famous collections followed. One result of the publication of these old ballads was a large number of imitative works, among which the most famous are, perhaps, Coleridge's *Ancient Mariner*, Tennyson's *Revenge* and Rossetti's *Sister Helen.* The chief value, from a literary standpoint, of this renewed interest in the ballad was the greater freedom which it gave to versification.

Bal'lantyne, James (1772–1833), the printer of Sir Walter Scott's works, born at Kelso. Successively a solicitor and a printer in his native town, at Scott's suggestion he removed to Edinburgh, where the high perfection to which he had brought the art of printing, and his connection with Scott, secured him a large trade. His firm became bankrupt, and Scott's fortunes were also wrecked. See Scott, Walter, Sir.

Ballantyne, Robert Michael (1825–1894), a prolific Scottish writer of tales for boys. His experiences in the backwoods of Rupert's Land, among the fur-traders and indians, and in the Bell Rock Lighthouse, were all utilized in producing sound, wholesome and interesting tales. Among these are *The Coral Island, The World of Ice* and *The Dog Crusoe.*

Bal'larat', a city and gold field of the colony of Victoria, Australia, 96 mi. n. w. of Melbourne. Ballarat was the scene of one of the earliest gold discoveries in Victoria, June, 1851, and for over fifty years has been the center of one of the richest gold-yielding districts in the world. A nugget weighing about 184 pounds was found at Ballarat and was sold for $52,500. Quartz mining is now the leading feature of the district, and gold-bearing reefs are remuneratively worked at a depth of 900 and 1000 feet. The town of Ballarat consists of two distinct municipalities, Ballarat East and Ballarat West, with an aggregate population of 44,766. It has iron-foundries, breweries and distilleries, several flour mills and other factories. It is connected by railway with Melbourne, and six lines of railway branch off to other towns.

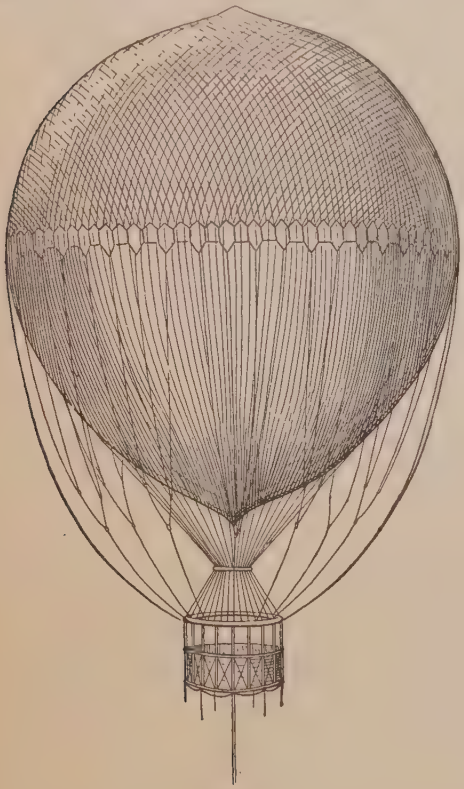
Ball-Cock, a kind of self-acting stop-cock, opened and shut by means of a hollow sphere or ball of metal, attached to the end of a lever connected with the cock. Such cocks are often employed to regulate the supply of water to tanks. The ball floats on the water in the tank by its buoyancy, and rises and sinks as the water rises and sinks, shutting off the water in the one case and letting it on in the other.

Ballet, *bal lay'*, a kind of dance, now used chiefly as interlude in a theatrical performance. Its original aim was to represent actions and feelings through dancing and gestures. This idea arose early in the eighteenth century, but the modern ballet differs greatly from the original, for it is now rather a spectacular dance than a dramatic representation, the main purpose being rather to please the eye than to impress the mind. The ballet as used in modern operas is more nearly the ballet of old, for it is usually more or less closely connected with the play and incorporated in it, as in *Faust* and *Tannhäuser.*

Balliol, *bayl'yol,* **College.** See Oxford, University of.

Balloon', a gas-tight bag or envelope, made of light material and filled with heated air or other gas lighter than ordinary air, so that it will rise and float in the atmosphere. Balloons are either spherical or pear-shaped. Those used for making voyages are covered with a strong net of cords, to the lower extremity of which the basket or car is attached. The first balloons were constructed by the Montgolfier brothers in

France in 1783. These brothers were papermakers, and from observing the clouds floating in the air they conceived the idea that a bag of some light substance would also float, if it were filled with something as light as the clouds. They constructed a spherical linen bag, 30 feet in diameter, and inflated it with hot air, by burning damp straw and wool at the mouth, very much after the manner that toy balloons are filled at the present time. This balloon rose to a height of over a mile, and the experiment attracted the attention of a large number of scientific men. A few months later a balloon made of silk and coated with rubber varnish, to make it gas-tight, was filled with hydrogen. This ascended to a height of 3000 feet and traveled 15 miles before lighting. It was torn into shreds by the terrified inhabitants in whose neighborhood it descended. The success of this experiment by Professor Charles, a leading physicist of Paris, led to the first successful balloon ascent, which was made in a balloon constructed on a plan similar to the first.



BALLOON

The modern balloon differs but very little from the one first constructed by Professor Charles. It contains a valve in the top for the escape of gas, and the mouth, through which it is filled, is left open so that the gas may escape when it expands on reaching high altitudes. The valve closes with a spring and is opened by a cord which reaches to the car. Since the discovery of illuminating gas, that has taken the place of hydrogen for inflating balloons, because it is much cheaper and because it does not escape as readily through the bars in the bag. However, this gas is much heavier than hydrogen, and the lifting power of a balloon filled with it is only about one pound for every thirty cubic feet of gas. Therefore, balloons designed for long voyages or to carry heavy loads need to be of large size. Some have been constructed having a diameter of 118 feet and a lifting capacity of over 55,000 pounds. The car is usually constructed of willow or some other light, strong material, and, besides the aeronaut, it contains thermometers, barometers and occasionally other instruments for recording atmospheric conditions. The aeronaut must be provided with a certain amount of ballast, which is usually in the form of sand, since by the use of this and the escape valve he is able to control the ascent and descent of the balloon.

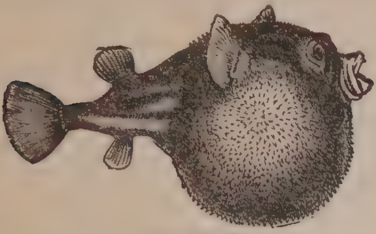
Balloons are used by meteorologists for securing information about the temperature, humidity and currents in the upper air. The two most remarkable voyages for this purpose are that of Glaishar and Coxwell in 1862, reaching an altitude of 29,000 feet, and that of Burson and Suring of Berlin in 1901, when by inhaling oxygen an altitude of 31,000 feet was reached. Unmanned balloons carrying self-recording instruments have reached an altitude of 72,000 feet, or 13½ miles.

Military Ballooning. Great Britain, Germany, France and the United States employ balloons in their military service, and their respective armies have a division whose officers and men devote their entire time to this branch of the service. Small balloons having a capacity of about 10,000 cubic feet are found to be the most successful for observations on the field. The balloon is attached to a rope or wire cable by means of which its movements are controlled. Hence it is called a captive balloon. In case of action the balloon is located about a mile in the rear of the front line, and the officer who ascends can telephone the position and movements of the enemy to the general in command.

The signal corps of the United States army has charge of this branch of the service. At

Omaha a large government plant has been established. This plant is equipped for constructing and housing balloons, and for compressing gas so that 2000 cubic feet of gas can be forced into an iron cylinder of one cubic foot capacity. These cylinders are easily carried and when the gas is needed it is liberated into the balloon. See FLYING MACHINE.

Balloon-fish, a curious tropical fish that can inflate itself, float back down on the surface of the water and thus escape pursuit.



BALLOON-FISH

Bal′lot, literally, one of many little balls (called by the French *ballottes*), usually of different colors, which are put into a box in such a manner as to enable the voter, if he chooses, to conceal for whom or for what he gives his suffrage. The method is adopted by most clubs in the election of their members—a white ball indicating assent, a black ball dissent. Hence, when an applicant is rejected, he is said to be *blackballed.* The term *voting by ballot* is now applied to any method of secret voting, as, for instance, when a person gives his vote by means of a ticket bearing the name of the candidate whom he wishes to support. In the United States the ballot was in use in early colonial times and was made compulsory in the constitutions of most of the states.

The *Australian ballot* system, originated about 1885 in the British colonies, has recently been adopted by law in most states of the Union. By a carefully contrived system of secluding each voter at the polls and of marking and folding the ballots, it secures greater secrecy and honesty than any other known method. There has recently been much agitation for a change in the form of ballots—the names of the candidates of each party being now usually printed in a column under a party symbol—so as to facilitate voting independent of party lines. Several states have already adopted various means to secure this end. See ELECTION.

Ball's Bluff, BATTLE OF, one of the first important battles of the Civil War, fought October 22, 1861, at Ball's Bluff, Va., between a detachment of about 2000 Federals of McClellan's army and a Confederate force which was lying in ambush. After a terrible hand to hand fight, the Federals were driven in confusion from the field with a heavy loss, including one of their commanders, Colonel Baker, ex-United States senator from Oregon.

Balm, *bahm,* a fragrant perennial herb belonging to the mint family, a native of the south of Europe and western Asia and naturalized in a few places in England. It has long been cultivated in gardens; the stems and leaves are still occasionally used in medicine as a gentle stimulant and tonic, and were formerly in high repute. The taste is somewhat bitter, and slightly aromatic. A variety of the common catnip, with a smell like that of balm, is often mistaken for it. Moldavia balm is a native of eastern Europe and Siberia. Bastard balm, a native of the south of England and of many parts of Europe, is a beautiful plant. When dried it has a delightful fragrance, which it retains for a long period.

Balmaceda, *bahl ma sa′dah,* JOSÉ MANUEL (1840–1891), a Chilean statesman, born at San′tiago. He early distinguished himself as a political orator, advocated in Congress the separation of Church and State, and as premier, in 1884, introduced civil marriage. Elected president in 1886, he soon came into armed conflict with the Congressional party, provoked by his alleged cruelties and official dishonesty. Balmaceda was utterly defeated and committed suicide at Santiago.

Balm of Gil′ead, the gum from a tree, a native of Arabia Felix; also obtained from another closely allied species. The balm of Gilead of the shops, or balsam of Mecca or of Syria, is obtained by making an incision in the trunk of the tree. The gum has a yellowish or greenish color, a warm, bitterish, aromatic taste and a sharp, fragrant smell. It is valued for its fragrance and its supposed medicinal powers.

Balmor′al Castle, one of the royal residences of Great Britain, beautifully situated on the south bank of the Dee, 45 miles west of Aberdeen. It stands in the midst of beautiful and varied mountain scenery and is surrounded by an estate of 40,000 acres. It is built of gray granite, in the Scottish baronial style, and consists of two separate blocks of buildings united by wings, and a tower 35 feet square and 80 feet high, with a turret rising 20 feet. Balmoral Castle was the favorite autumn residence of Queen Victoria.

Balsam, *bawl'sam,* an aromatic, resinous substance flowing from certain plants. A great variety of substances pass under this name. In chemistry the term is confined to such vegetable juices as consist of resins mixed with volatile oils. It is soluble in alcohol and ether and is capable of yielding benzoic acid. The balsams are either liquid or more or less solid; as, for example, the balm of Gilead and the balsams of Copaiva, Peru and Tolu. Benzoin, dragon's-blood and storax are not true balsams, though sometimes called so. The balsams are used in perfumery, medicine and the arts. See BALM OF GILEAD.

Balsam Fir. See FIR.

Baltic, *bawl'tik,* **Provinces,** a term commonly given to three Russian governments bordering on the Baltic, namely, Courland, Livonia and Esthonia. The area is 36,560 sq. mi. The soil is not very fertile and agriculture is not an important industry. Commerce and manufactures are highly developed and are aided by the Baltic. Livonia and Esthonia once belonged to Sweden, and Courland was a dependency of Poland. Through the conquests of Peter the Great early in the eighteenth century, all came into the possession of Russia. Population, 2,387,000.

Baltic Sea, an inland sea or large gulf in northern Europe, washing the coasts of Denmark, Germany, Russia and Sweden. A chain of islands separates the southern portion from the northern, which is called the Gulf of Bothnia. The northern extension includes the gulfs of Riga and Finland, indenting the coast of Russia, and the Gulf of Bothnia, between Russia and Sweden. The Baltic receives the drainage of a large part of northern Europe, and more than 250 rivers flow into it. Owing to this drainage, the water of the Baltic contains only one-third as great a per cent of salt as the Atlantic. There is a large trade, the important harbors being at the cities of Copenhagen, Viel, Danzig, Memel, Riga, Kronstadt and Stockholm. The Kaiser Wilhelm Canal, near Kiel, affords access to the North Sea (See KAISER WILHELM CANAL). Storms are frequent, often causing severe losses, and navigation in the northern part is hindered by ice during the winter season. The Baltic Sea is of great commercial importance to northern Europe. See CATTEGAT; SKAGERRAK.

Baltimore, *bawl'ti mor,* MD., chief city of the state and seventh largest city of the United States, is situated in Baltimore co., on the north side of the Patapsco River, 14 mi. above Chesapeake Bay, 94 mi. s. of Philadelphia and 42 mi. n. e. of Washington. The city rises from the water front in a gradual slope toward the north. The wholesale and manufacturing districts are on and about the branches of the river, the northwest branch extending almost into the center of the city and giving ample opportunity for docks. The greatest extension of the city is from east to west, and the principal streets running in this direction are Baltimore and Lexington, while Charles is the principal street running north and south. The city is divided into nearly equal east and west portions by a small stream called Jones Falls. The residential and newer part of the city is in the west and northwest sections, while the eastern portion contains most of the old town. With the exception of those of the northwest section, all of the main streets extend east and west and north and south. Baltimore Street and Charles Street divide the city into four sections, and the numbering is on the decimal scale and extends from these streets in each direction.

PARKS AND BOULEVARDS. The city has a number of beautiful and interesting parks. Chief among these is Druid Hill Park, containing Druid Lake and noted for its beautiful walks and drives and a number of monuments and statues. This park is situated in the northwestern portion of the city. In the northeast portion is Clifton Park, containing Clifton Lake, and in the eastern section, near the river, is Patterson Park, which includes a number of squares. Besides these, there are several small parks so distributed through the city that they are within easy access. Carroll Park was the former home of the Carrolls, who were prominent in the early history of the country.

In the center of the city, between Fayette and Lexington streets, is Monument Square, which contains the battle monument erected in 1815 to the memory of those who fell in the defense of the city in the War of 1812. The Washington Monument, erected between 1815 and 1830, stands in the heart of the city, at the intersection of Mount Vernon and Washington streets, and contains a colossal statue of Washington mounted upon a Doric column. It was the early erection of this structure that gave Baltimore the name of the "Monumental City." Other monuments and statues of note are the one to the memory of Columbus, the statue of Sir William Wallace and the Wildey Monument, erected to the founder of the Order of Odd Fellows in the United States. There are a number of cemeteries in and about the city which are noted for their extent and beauty. Chief among these are Greenmount Cemetery, Loudon Park and the National Cemetery, containing the graves of a large number of Union soldiers.

Buildings. The city is well built, but most of the older structures are of brick. Chief among the public buildings are the city hall, which occupies an entire square and cost over $2,271,000. This is a marble structure and is noted for its immense dome, which is 260 feet high. To the west of the city hall is the United States government building, and beyond this the United States courthouse, which is a massive granite structure. The Masonic Temple, near the intersection of Charles and Saratoga streets, is also worthy of mention. The most important churches are the Roman Catholic cathedral, a granite structure in the form of a cross; the Mount Vernon Methodist church, of green serpentine; the First Presbyterian church and the Unitarian church. Among the buildings recently constructed, that of the Baltimore & Ohio railroad is one of the most noted, and one of the finest, office buildings in America.

Institutions. Baltimore maintains an excellent system of public schools, and has, in addition, the Peabody Institute, containing a free library of over 130,000 volumes; the Athenaeum, which contains collections of the Maryland Historical Society and the libraries of this society and the Mercantile Library Association; the Maryland Institute, designed for the promotion of mechanic arts; the Johns Hopkins University, one of the finest institutions of higher learning in the country (See Johns Hopkins University); the University of Maryland, and the Pratt Free Library, which contains over 200,000 volumes.

Among the charitable institutions is the Johns Hopkins Hospital, the state asylum for the insane, the Baltimore orphan asylum, Saint Paul's Orphan Asylum and a number of sanitariums and schools for indigent children.

Commerce and Industry. Baltimore is favorably situated for both domestic and foreign commerce. The city has an excellent harbor at the head of Chesapeake Bay, is well sheltered and deep enough for the largest ocean vessels. Consequently lines of steamers are maintained between the city and nearly all important European ports. It is also an important railroad center, being one of the chief points on the Baltimore & Ohio and the Pennsylvania systems and their connecting lines. It has excellent railway connections with the northern, southern and central portions of the country.

The leading industries consist in the manufacture of clothing, textiles, boots and shoes, flour, fertilizers, bricks, machinery and various metallic wares, and in the canning of fruits and oysters. The oyster fisheries of Chesapeake Bay are extensive, and Baltimore is the chief center of this trade.

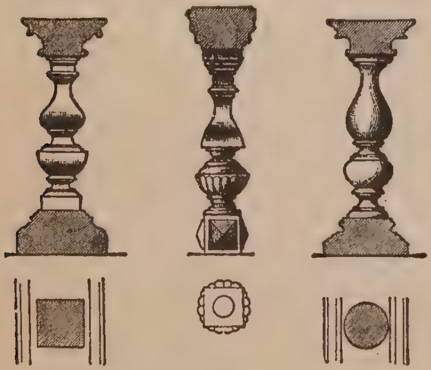
History. The city was founded in 1729 and named in honor of Lord Baltimore, proprietor of the Maryland colony. It was incorporated in 1796. Baltimore suffered a bombardment in the War of 1812, but, owing to the gallant defense of the garrison at Fort Henry and in other fortifications, was not captured. From the close of the War of 1812 to the beginning of the Civil War, the city grew steadily and became an important shipping port. The ships constructed here became famous throughout the world as the *Baltimore Clippers*. The Civil War was disastrous to the growth of the city, since connection with the South was cut off and nearly all of the commerce and manufactures were either crippled or suspended; but after 1865 Baltimore regained her former prosperity and grew rapidly. In February, 1904, a disastrous fire devastated nearly all of the business portion of the city, destroying over 1500 buildings and nearly $80,000,000 worth of property. The burnt district has been rebuilt on a greatly improved plan, and notwithstanding the fire the city gained nearly 50,000 inhabitants in ten years. Population in 1910, 558,485.

Baltimore, Sir George Calvert, Lord (1580–1632), a British statesman. He was for some time secretary of state to James I, but this post he resigned in 1624 in consequence of having become a Roman Catholic. Notwithstanding this, he retained the confidence of the king, who in 1625 raised him to the Irish peerage. He had previously obtained a grant of land in Newfoundland, but as this colony was much exposed to the attacks of the French, he left it and obtained another patent for Maryland. He died before the charter was completed, and it was granted to his son Cecil, who founded the colony.

Baltimore O'riole, Hangbird, Firebird or **Golden Robin,** one of the most beautiful of the birds that nest in northern United States, a relative of the blackbird. It is about seven inches long, has a black head and upper parts and brilliant orange under parts. It weaves a long, graceful, pouch-like nest, usually far out on the tip of a high limb, where it is shaded by overhanging leaves. It is a courageous bird and is quite able to protect its nest from much stronger and larger birds. Its song is sweet and clear, and this, with its bright colors and its destructiveness to insects, make it a great favorite with every one. It is called the Baltimore oriole because black and orange were the colors of Lord Baltimore. It was named by Linnaeus, whose first specimen came from Maryland.

Baluchistan or **Beluchistan,** *ba loo′chi-stan,* a country in Asia, bounded on the n. by Afghanistan, on the e. by British India, on the s. by the Arabian Sea and on the w. by Persia. The general surface of the country is rugged and mountainous, with some extensive intervals of barren, sandy deserts, and there is a general deficiency of water. Cotton, indigo and various fruits grow in several parts of the country. The date palm is abundant in the southwest. The country is almost entirely occupied by pastoral tribes under semi-independent sirdars or chiefs. The khan of Khelat is nominal ruler of the whole land, and in 1877 concluded a treaty with Great Britain which placed the whole country at the disposal of the British government for all military and strategical purposes. Khelat is the capital, and Quetta, a town in the northeast, is the principal city.

Bal′uster, the name applied to the small pillars or columns which are used in a series and topped by a rail or coping, thus forming a balustrade. Balustrades are used to surround the roofs of houses and open spaces and also to serve as guards for stairways and as parapets for bridges. Balusters are often vase or urn shaped, having the swelling at the lower end, or consist of two vase-shaped pieces, one above the other, with a molding between them.



BALUSTERS

Balzac′, Honore de (1799–1850), the greatest of French novelists. He was educated for the law, but his inclinations were always toward literature, and from an early date he wrote novels. None of these had any particular merits, and only with the publication in 1829 of *The Chouans* did it become evident that the young writer was a man of genius. This genius he turned to the carrying out of a plan for representing in a series of novels, to be called *The Human Comedy,* all the phases of human life in the France of his day. The outcome of this ambitious plan was an astonishing number of novels, containing the marvelous delineations of character which entitled him to rank almost with Shakespeare in his power to portray men. That all sides of life might be presented, Balzac often introduced into his works accounts of most immoral and licentious characters and happenings, but with it all he does not neglect to lay stress upon the better and more ideal aspects of life. The best of his novels are generally considered to be *Eugénie Grandet,* a study in avarice, which is by many critics considered to be the greatest of the world's novels; *Cousine Bette; Lost Illusions* and *Poor Relations.* During the latter part of his life Balzac was much influenced by Madame Hanska, a Polish countess, with whom he had fallen in love. This interest, while in some ways it worked for good, often dissipated his attention and made his work less powerful. He married Madame Hanska only a few months before his death.

Bambarra, *bam bahr′ra,* a former kingdom in Western Africa, situated on the Upper Niger. The country is mountainous in the southwest and flat in the northern part. It is generally very fertile, producing large crops of corn, rice, maize and yams. The principal industries are the weaving of cloth and the manufacture of leather and metal products. The commerce is quite extensive. The inhabitants belong to the Mandingo race and are partly Mohammedans. Population, estimated at 2,000,000.

Bamberg, *bahm′berg,* a town of Germany, Bavaria, 33 mi. n. of Nuremberg. It is the seat of a Catholic archbishop and contains a cathedral founded in 1004, one of the finest churches in Germany; the churches of Saint James and Saint Mary; a royal palace, and a royal library. The royal library contains 100,000 volumes and valuable manuscripts. Bamberg carries on a large trade, its industries being cotton spinning, tobacco manufacture and brewing. Population in 1900, 41,630.

Bamboo′, the common name of the giant, tree-like grasses of the tropics and sub-tropics. There are many species, belonging to Asia, Africa and America, and they vary in height from a few feet to a hundred feet. From the long, thick, creeping underground rootstalk, spring several round, jointed stalks, which send out from their joints several shoots and one or two sharp, rigid spines. The oval leaves, eight or nine inches long, grow on short footstalks, and the flowers grow in large clusters from the joints of the stalk. Some stems grow to eight or ten inches in diameter and are so hard and durable as to be used for building purposes. The smaller stalks are used for fishing rods, walking sticks, flutes, and for innumerable other purposes. In the East Indies, China and other Eastern countries, cottages are almost wholly made of bamboo; bridges, boxes, water pipes, ladders, fences, bows and arrows, spears, baskets, mats, paper and masts for boats are but a few of the other uses to which it is put. The seeds of some species are also edible, and the young shoots are pickled and eaten. The bamboo is imported into Europe and America as a paper material, as well as for other purposes.

BAMBOO

Bamian, *bahm e ahn′*, a valley and pass of Afghanistan, the latter at an elevation of 8496 feet, the only known pass over the Hindu Kush for artillery and heavy transport. The valley is one of the chief centers of Buddhist worship and contains five remarkable colossal statues, from two to three hundred feet high, carved in the rocks, and other ancient monuments.

Banana, *ba nah′na*, a plant originally a native of the East Indies. It is really an herb with an underground stem, and the trunk, which is sometimes as high as thirty feet, is really not a trunk at all, but is formed by the closely compacted sheaths of the fallen leaves. These leaves, which grow to be six or ten feet long and one or more broad, have strong mid-ribs from which veins are given off at right angles. The leaves are used for covering the roofs of houses, for basket-making and, besides, yield a useful fiber, of which manila hemp is an example. In the countries where the banana is native, the uses to which it can be put are innumerable. The spikes of flowers grow nearly four feet long, in small bunches, covered by purple-colored bracts. The great cluster hangs down from the summit of the plant, and, as the bracts fall off one at a time, the flowers under each bract blossom with their faces toward the ground, but as the separate fruits begin to grow, they turn upward. A bunch of bananas in a store is hung bottom side up. The bananas are from four to ten or twelve inches long and one inch or more in diameter, and a bunch of them often weighs from forty to eighty pounds. The banana is cultivated in tropical and subtropical countries and is an important article of food. Enormous quantities of the fruit are annually shipped into the United States from Mexico, Central America and the West Indies, and increasingly large quantities are being raised in the warmer parts of this country.

BANANA

Banana, an island, and also a seaport, situated at the mouth of the Kongo River. This was formerly an important commercial port, but the construction of a railroad from Matadi, on the coast, to Leopoldville, drew the ocean traffic to Matadi, and Banana has now lost its importance as a commercial center.

Banca or **Banka**, *bahn'ka*, an island belonging to the Dutch East Indies, between Sumatra and Borneo. It is 118 miles long. It is celebrated for its excellent tin, of which the annual yield is above 4000 tons; but it produces nothing else of any importance. Population, 93,600.

Ban'croft, George (1800–1891), an American historian, born at Worcester, Mass. He graduated from Harvard in 1817, studied history and philology in Germany and then traveled for some years in Europe. During his travels he formed the acquaintance of eminent scholars, among them Wilhelm von Humboldt and Schleiermacher. After returning to America he taught for a time, preached occasionally and in 1838 was made collector of customs at Boston. While lecturing on German literature he continued his literary labors and published (1841) *The History of the Colonization of the United States.* Later this work was embodied in his larger history of *The United States of North America.* He was secretary of the navy under Polk (1845), established the naval school at Annapolis and from 1846 to 1849 was ambassador to England. He published (1852) a *History of the Revolution in North America,* from material collected while in England. His oration in honor of Abraham Lincoln, delivered in 1866, is of historic value. He was minister to Russia (1867), to the North German Confederation (1868), and in 1871 was sent as ambassador to the German Empire. For many years he was an eminent contributor to *The North American Review.* While secretary of the navy he gave the order to take possession of California in case of war with Mexico. He was secretary of war one month, and gave the order to march into Texas. His last public address was given at Washington, D. C., April 27, 1886.

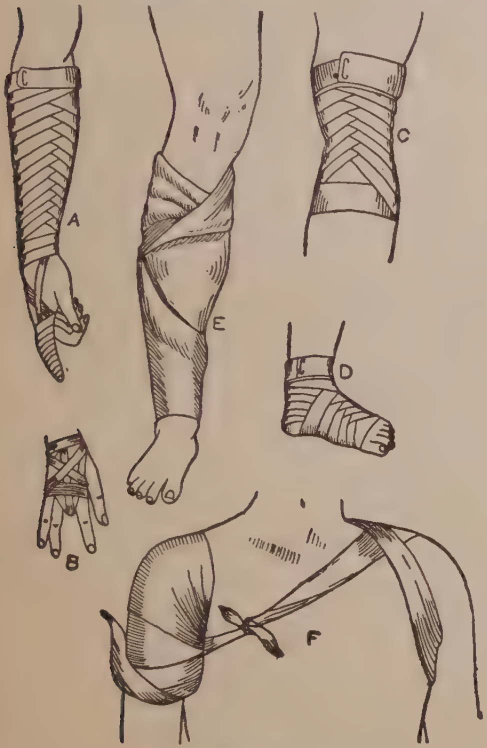
GEORGE BANCROFT

Bancroft, Hubert Howe (1832–), an American historian, born in Ohio. He went to California in 1852 and engaged in the publishing business. Becoming deeply interested in the history of the Pacific coast regions, he collected a library relating to the subject and gave himself up to its classification and to original work on the subject. In 1875 he published in five volumes his work on *The Native Races of the Pacific States,* and in 1882 he published the first volume of his *History of the Pacific States.* He also wrote on the Spanish missions of California and the vigilance committees.

Band, a name given to a combination of musical instruments that may be played upon the march. This form of music did not arise until after the middle of the thirteenth century, when traveling musicians joined together in guilds. At first these musicians played no written music, believing that they would be able to attain a greater influence if their profession was surrounded with some mystery. The *military* band is usually connected with a military body, such as an infantry or cavalry regiment. It is composed chiefly of wind instruments, such as clarinet, piccolo, cornet, trombone, oboe, saxophone, baritone, bass horn, tuba and bass and snare drums. Gilmore was probably the most noted leader of military bands in America, but at the beginning of the twentieth century John Philip Sousa had succeeded to his place as a leader of both concert and military bands. In America military bands are composed of enlisted men; in England they are chosen especially from the schools. The greatest band of the kind in the United States is the United States Marine Band at Washington. In Europe there are the Royal Artillery and the Royal Marine of England, the Grenadier of

Germany, the Garde Republicaine of France, the Ottoman Palace of Turkey, the Bersaglieri of Italy and the Czar's Regiment of Guards of Russia. The so-called *brass* band, as its name indicates, is composed principally of brass instruments, giving a powerful but rather coarse tone to the music. The *fife and drum corps* is a popular form of band in America.

Band′age, a surgical wrapper of some kind applied to a limb or other portion of the body to keep parts in position, exert a pressure, or for other purpose. Ordinary roller bandages are long strips of flannel, linen, cheese-cloth or other soft fabric, from one to five or six inches in breadth and from twenty to thirty feet in length. The outer end is laid on the limb and the strip is wound smoothly around in a spiral so that each turn overlaps the previous one. Special bandages are required for special cases. In the drawing may be seen samples of several forms of bandages and particular ways of applying them.



BANDAGES
A, *B*, *C* and *D*, roller bandages
E and *F*, triangular bandages.

Banda, *bahn′da,* **Isles,** a group of islands in the Indian Archipelago, belonging to Holland. They are beautiful islands of volcanic origin. They yield large quantities of nutmeg and mace. Gunong Api, or Fire Mountain, is a cone-shaped volcano, which rises 2320 feet above the sea. Population, about 8000.

Ban′dicoot, the largest known species of rat, measuring about a foot in length. It is a native of India and is very abundant in Ceylon. Its flesh is said to be delicate, resembling young pork, and is a favorite article of diet with the natives. It lives on grains and vegetables and is very destructive to rice fields and gardens. The name is also given to a family of Australian marsupials.

BANDICOOT

Bane′berry, a European plant, local in England, with a spike of white flowers and black, poisonous berries. Two American species are considered remedies for rattlesnake bite.

Banff, *bamf,* a pleasure and health resort in Alberta, Canada, on the Canadian Pacific railroad. It is noted especially for its beautiful scenery. It has a fine hotel, sulphur springs, open-air swimming pools and a sanitarium. The village has a population of about 250, but during the season it is filled with visitors.

Bangalore, *ban ga lor′,* a town of Hindustan, capital of Mysore, that gives its name to a considerable district in the east of Mysore state. The town stands on a plateau 3000 feet above sea-level and is one of the pleasantest British stations in India. In the old town stands the fort, reconstructed by Hyder Ali in 1761 and taken by Lord Cornwallis in 1791. There are manufactures of silks, cotton cloth, carpets and gold and silver lace. Population in 1901, 159,046.

Ban′gor, Me., the county-seat of Penobscot co., on the Penobscot River and on the Maine

Central and other railroads. A dam across the river above the city affords water power for extensive manufactures, which include furniture, carriages, trunks, agricultural implements, shoes, clothing and dairy products. There are also flour mills, shipyards, pork-packing establishments and extensive iron foundries. Bangor Theological Seminary is located here, also the Eastern Maine asylums. The first settlement was made in 1769 and was known as Kenduskeag Plantation till 1787, when it was called Sunbury. In 1791 it was incorporated as Bangor. Population in 1910, 24,803.

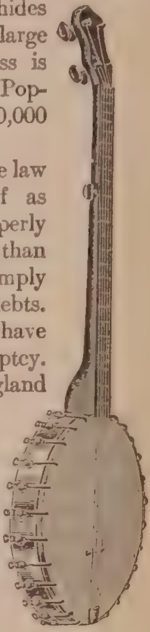
Bangs, John Kendrick (1862–), an American editor and humorist, whose home is in Yonkers, N. Y. After graduating at Columbia College he studied law, but in 1888 became editor of the Drawer and of Literary Notes, in *Harper's Magazine.* His light verse and highly amusing stories are everywhere popular. *Tiddledywinks Tales, Three Weeks in Politics, Mr. Bonaparte of Corsica, The Bicyclers, A Houseboat on the Styx, Ghosts I Have Met, The Enchanted Typewriter, The Idiot at Home, Over the Plum Pudding* and *Molly and the Unwise Man* are some of his best known stories.

Bangweo'lo or **Bemba,** the southernmost of the great lake reservoirs of the Kongo, discovered by Livingstone in 1868. It is an oval-shaped, shallow sheet of water, said to be 150 miles in length from east to west and about 75 miles in width, but its exact limits are uncertain. Henry M. Stanley visited this lake in 1876, on his expedition across Africa.

Banian, *ban'yan,* an Indian trader or merchant, one engaged in commerce generally, but more particularly one of the great traders of western India, who carry on a large trade with the interior of Asia by means of caravans, and with Africa by vessels. They form a class of the Vaisya caste, wear a peculiar dress and are strict in the observance of fasts and in abstaining from the use of flesh. Hence *Banian days* were days in which sailors in the navy had no meat served out to them. Banian days are now abolished, but the term is still applied to days of poor fare. See Banyan.

Ban'jo, a five- to nine-stringed musical instrument, with a body like a tambourine and a neck like a guitar. It is played by stopping the strings with the fingers of the left hand and twitching or striking them with the fingers of the right.

Ban'kok, the capital of the kingdom of Siam. The city is situated on an island and is intersected by many little canals. A large portion of the population live in boats or wooden houses, erected on bamboo rafts, which are moored in the river and form a kind of floating town. The exports consist chiefly of rice, sugar, silk, cotton, tobacco, pepper, sesame, ivory, hides and teak, which is shipped in large quantities. Most of the business is in the hands of the Chinese. Population, estimated between 250,000 and 600,000.



BANJO

Bank'rupt, a person whom the law does or may take cognizance of as unable to pay his debts. Properly the term is of narrower meaning than *insolvent,* an insolvent person simply being unable to pay *all* his debts. In all civilized communities laws have been passed regarding bankruptcy. At present bankruptcy in England is regulated by an act of 1883, which has as its essential feature the intervention of the Board of Trade at all stages of the bankruptcy, with the object of obtaining full official supervision and control. In America Congress has the power of legislating upon bankruptcy, and upon two occasions it has done so, the present federal statute being passed in 1898. Bankruptcy proceedings may be begun either by a debtor or his creditors, the former case being *voluntary bankruptcy,* the latter, *involuntary.* A man may be adjudged a bankrupt for (1) concealing or transferring goods in order to defraud creditors, (2) transferring goods in order to give certain creditors preference over others, (3) allowing a creditor to gain preference through legal proceedings, (4) making an assignment of his property to his creditors, (5) signing a statement of his inability to pay his debts. If he is adjudged a bankrupt, a trustee is appointed who has possession of all his property and divides it *pro rata* among his creditors. The bankrupt is thereupon discharged of all his debts.

Banks, Nathaniel Prentiss (1816–1894), an American soldier, born at Walton, Mass. He learned the trade of a machinist, but later became a local newspaper editor, a lawyer, then representative in the legislature, governor of Massachusetts, speaker in the United States Congress, and general of volunteers in 1862. His first military effort was made at the Battle of Winchester, where he was attacked by the forces of "Stonewall" Jackson, and later he was placed in command of the defenses of Washington while preparations were being secretly made to send a strong expedition by sea to New Orleans. He was placed in command of this expedition, which set out early in 1864, and on reaching New Orleans he succeeded General Butler in command. This expedition, while it met with some successes, did not accomplish its object, and in May, 1864, General Banks was relieved of his command, resigned his commission and returned to his native state. He was elected to Congress by his former constituents and served for many terms. For a long time General Banks was chairman of the committee on foreign relations. He afterward served as United States marshal for Massachusetts and was again elected to Congress in 1888.

Banks, SAVINGS. See SAVINGS BANKS.

Banks, THOMAS (1735–1805), an English sculptor. He studied sculpture in the Royal Academy and in Italy. On leaving Italy he spent two unsatisfactory years in Russia, and he then returned to England, where he was soon after made an academician. Among his works was a colossal statue of *Achilles Mourning the Loss of Brĭseis*, in the hall of the British Institution, *Cupid Catching a Butterfly* and a group called *Armed Neutrality*, for Catherine II of Russia.

Banks and Banking. PURPOSES AND FUNCTIONS. A bank is an institution or organization for the purpose of handling money. Its chief functions are to provide a place of safe keeping and deposit for money, to borrow and lend money, and in some instances to issue bills or notes for circulation as currency. The proper performance of these functions serves many useful purposes in mercantile affairs. The first and most important is the keeping or hoarding of money in order to hold it secure from robbers. Originally a charge was made to the depositor for this purpose. Secondly, by accepting the contributions of a large number of depositors, banks vastly increase the available capital of a community by concentrating it for use in such amounts as are convenient in ordinary commercial affairs. Thirdly, they facilitate to a remarkable extent all business and exchange. They bring together those who have money lying idle and those who are able to use the money with profit to themselves. Fourthly, they afford a safe and convenient method of paying debts. For instance, *A* owes *B* $100. Instead of drawing this amount from a bank in which he has it deposited, *A* gives *B* an order on the bank for $100, which when presented at the bank is promptly paid. This order is called a *check*. If *A* and *B* are both depositors in the same bank, *B* deposits the check which he has received from *A* and $100 is added to his account and $100 subtracted from *A*'s account. Thus, the debt is paid and no money changes hands. The same method is employed if *A* and *B* are in different cities, the check in this instance being called a *draft*. This exchange is facilitated by the policy of all banks to maintain accounts with banks in other important commercial centers. The system of paying debts by checks which are not collectable except by the parties in whose favor they are drawn, or when endorsed by those parties, evidently constitutes a perfectly safe means of transferring funds. At the same time it facilitates business in another way. Because of the use of checks only a small part of the money deposited in a bank need be kept on hand, the rest being loaned out at such an interest as will net a profit to the institution. Thus, much more money is available for investment than would be possible if every bank had to retain an amount sufficient to pay in cash the claims made upon it from day to day.

NATIONAL SYSTEMS. The systems of banking which exist in different countries, though agreeing in general principle in accordance with the above statements, differ in details. In *England* the most important banking institution is the Bank of England, which was incorporated in 1694 as a joint-stock association, with a capital of £1,200,000. It loaned its entire capital to the government and received the right to issue notes for circulation, and also was given a monopoly of the banking business of the country, with the privilege of establishing branch banks. Gradually the charter has been amended and extended until the present capital of the bank, to the extent of which it is allowed to issue bills of circulation, is £15,750,000. All its notes are redeemable in gold and therefore pass freely at par anywhere in the world. It holds deposits amounting to more than $225,000,000, has outstanding loans of nearly $170,000,000, and by reason of its many branches and sound basis is the most influential financial institution in the world. *Scotland* and *Ireland* each has a separate banking system.

The Bank of *France* was established in 1800, upon a basis similar to that of the Bank of England. It has the sole right to issue paper money in France and its notes are issued upon such excellent security that they pass as readily as do those of the Bank of England. It has often come to the aid of the government in time of need. and in 1890, when the London money market was undergoing a severe strain, the Bank of France relieved the situation there and throughout the world by advancing a large sum in gold. The banking systems of other European countries are in most respects similar to that of France.

The system now in use in the *United States* differs in important points from any of those mentioned above. The national bank system was organized by a law passed in 1863. Under this act banks may be organized by five or more persons, authorized to issue notes for circulation by purchasing government bonds with their capital stock. At first the issue of notes was limited to ninety per cent of the face value of these bonds, but by an act of 1900 this restriction was removed, and the banks are now allowed to issue notes to the full amount of their bonds, or in excess of this amount, if gold or specie to cover the excess is deposited with the United States government. At first the minimum capital stock allowed was $50,000, but by the act of 1900 this was made $25,000 for banks in towns having a population of three thousand or less. Strict supervision of all operations of the national banks is exercised by the government through a system of examiners, directed by the comptroller of the currency. Besides these there are many hundreds of state and private banks; in many states the latter are not subject to state examination, as are the former. Each state and national bank is required to keep on hand a certain per cent of its deposits, an amount large enough to allow the bank to meet all ordinary drafts and such special emergencies as may occasionally arise. The banking system of the United States lacks one important feature common to almost every other national system in the world; namely, the central bank with authority to establish branches in various parts of the country. Some financiers have claimed that this is its greatest weakness, since under the present system it is always difficult, and sometimes impossible, to adjust the currency to the needs of the different sections of the country as they arise under the influence of different seasons of the year and other local conditions. In August, 1910, there were 7184 national banks in the United States, with a capital of $1,022,000,000 and a circulation of $717,000,000. At the same time there were in the country 8258 state banks, 993 private banks, 852 loan and trust companies, besides savings banks, making in all 18,235 banks in the country. The above list does not include school savings banks, immigrant banks nor postal savings banks, the establishing of which in this country is a recent movement.

History. Banking has existed since the earliest times, records having been found of accounts kept by banking institutions for several centuries B. C. In fact, the methods employed to-day are in large measure founded upon those in use among the earliest Romans. The first bank whose history can be traced was the Bank of Venice, established in 1171 and continuing almost until the nineteenth century. Originally it was a purely government institution, its purpose being to assist the government in its financial transactions. By the end of the sixteenth century banks were flourishing in nearly every large city of Europe, most of them being founded for the same purpose as the Bank of Venice. Gradually they assumed other functions, such as receiving deposits. The present check and draft system originated about the beginning of the seventeenth century. The policy of making loans to the government led naturally to loans to individuals and business firms, and when this system became firmly established the banks began to depend for support upon the revenue received from these loans instead of from fees paid by depositors. Finally, banks began to pay depositors for the use of funds while in their keeping, and in this was the origin of the interest upon savings accounts. Since that time modifications in banking methods have been always in the direction of making deposits more secure, in gaining greater security for loans, in facilitating exchanges and providing an elastic but stable currency.

The first bank chartered in the United States was opened in 1780 under an act of Congress, but was rechartered by Pennsylvania in the following year, owing to opposition to the policy of government control of finances. The first really *national* bank was organized for the first time in 1791, with a capital of $10,000,000, the government retaining the right to subscribe one-fifth of this amount. Its charter was limited to twenty years. The headquarters of the bank were at Philadelphia, but it established branches in several other cities. At the expiration of its charter the opposition of local and state banks had become so influential that the charter was not reissued. Disastrous financial conditions followed, and as a result another United States Bank was chartered under President Madison in 1816, its capital being $35,000,000, of which the government subscribed $7,000,000, and individual citizens took the remainder. This charter was also limited to twenty years. During its existence it did valuable service in maintaining a fairly uniform currency and in facilitating exchanges through its branches in different parts of the country. But under President Jackson the demands of rival institutions for its destruction were heeded, and though Congress rechartered the bank in 1831, the act was vetoed by President Jackson. Under Van Buren a sub-treasury or independent treasury system was substituted, and until the establishment of the present national banking system, it proved an efficient means of regulating the currency and providing for the financial needs of the country. Under this system the funds of the government were deposited in government vaults in various cities, where they were kept until used by order of the executive department of the United States. Thus, the government was entirely separated from the banking business, except at times when the unusual demands upon the banks could not be met by them, when government funds were released to relieve the situation. Since the Civil War, however, though the sub-treasuries are still in existence, the principle of complete separation of the government and the banks has been abandoned, government funds being deposited in many of the national banks throughout the country. See Savings Banks; Clearing-house; Currency; Negotiable Paper; Notes.

Ban'nockburn, a village in Scotland on the Bannock rivulet, 3 mi. s. e. of Stirling. Here was fought, in 1314, the great battle by which Robert Bruce, through his victory over Edward II, won independence for Scotland. The English lost about thirty thousand men, while the Scotch lost but eight thousand.

Ban'shee, a weird hag, or ghost, believed in Ireland and some parts of Scotland to attach herself to a particular house, and to appear or to make her presence known by wailing before the death of one of the family.

Bantu, *bahn'too,* the general name of a group of African races, including, among others, the Kaffirs, Zulus and Bechuanas, but not the Hottentots.

Banx'ring, an insect-eating quadruped, inhabiting the Indian Archipelago, bearing some resemblance to the squirrel, but having a long, pointed snout. It lives among trees, which it ascends with great agility.

Ban'yan or **Ban'ian,** a remarkable fig tree of India. The peculiar feature of this tree is its method of throwing down from the horizontal branches supports which take root as soon as they touch the ground, enlarge into trunks and, extending branches in their turn, cover a wide extent of ground. As the Hindu word for trader is *banian,* it is probable that the tree is so called because the Hindu merchants frequently spread their goods in the shade of these tree-forests. Banyan wood is soft and porous, and from its white, sticky juice birdlime is sometimes prepared. Lac is made from the tree, and its bark and juice are both favorite Hindu medicines. One of the largest banyan trees known to exist was discovered on one of the Howe Islands, 300 miles from Port Macquarie, in Australia, and covered nearly seven acres. Five acres is the area covered by a banyan tree growing on the banks of the river Narbudda, in India. It is distinguished by the name of Cubbeer Burr, which was given it in honor of a famous saint. High floods have at various times swept away parts of this extraordinary tree, but what remains is nearly 2000 feet in circumference, measured round the principal stems; the overhanging branches not yet struck down cover a much larger space. The large trunks of this tree number 350, and the smaller ones exceed 3000, every one of which is constantly sending forth branches and hanging roots to form other trunks. It is said that 7000 persons find ample room to repose in its shade.

BANYAN TREE

Ba'obab, a tree, the only known species of its genus. It is one of the largest of trees, its trunk sometimes attaining a diameter of thirty feet; and as the profusion of leaves and drooping boughs sometimes almost hides the stem, the whole forms a hemispherical mass of verdure 140 to 150 feet in diameter and 60 to 70 feet high. It is a native of western Africa and Abyssinia and is cultivated in many of the warmer parts of the world. The roots are of extraordinary length, a tree 77 feet in circumference having a tap-root 110 feet in length. The leaves are deep green, divided into five unequal, narrow, fan-shaped parts. The flowers, which resemble the white poppy and have snowy petals and violet-colored stamens, hang in graceful clusters from stems three feet long. The fruit, which is large and of an oblong shape, is said to taste like gingerbread, with a pleasant acid flavor. In some localities the fruit is known as monkey-bread. The wood is pale-colored, light and soft. By the negroes of the West Coast the trunks are hollowed into chambers, and dead bodies are suspended in them. There the bodies become perfectly dry and well preserved, without further preparation or embalming. The pulverized leaves constitute *lalo*, which the natives mix with their daily food to diminish excessive perspiration, and which is even used medicinally by Europeans. The expressed juice of the fruit is used as a cooling drink and as a seasoning for various foods. The fiber of the bark is made into ropes and cloth.

Bap′tism, a rite which is generally thought to have been administered to proselytes by the Jews, even before Christ. From this baptism, however, that of Saint John the Baptist differed, because he baptized Jews, also, as a symbol of the necessity of perfect purification from sin. Christ himself never baptized, but directed his disciples to administer this rite to converts (*Matt.* XXVIII, 19); and baptism, therefore, became a religious ceremony among Christians, taking rank as a sacrament with all sects which acknowledge sacraments. In the primitive church the person to be baptized was dipped in a river or in a vessel, with the words which Christ had ordered, and was given a new name to express the complete change. Sprinkling, or, as it was termed, *clinic* baptism, was used only in the case of the sick who could not leave their beds. The Greek church and Eastern schismatics retained the custom of immersion; but the Western church adopted or allowed pouring or sprinkling, which has since been continued by most Protestants. Since the Reformation there have been various Protestant sects called Baptists, holding that baptism should be administered only by immersion, and to those who can make a personal confession of faith. Different churches have adopted various customs in connection with baptism. The Greek, Reformed and Roman churches baptize infants. The Church of England makes the sign of the cross on the forehead of the candidate. Some churches formerly anointed with oil to signify the gift of the Holy Spirit, or breathed upon the candidate to drive out the devil.

Bap′tistry, a term denoting the separate building or the portion annexed to a church where the rites of baptism are administered. Those of the early churches were usually circular or polygonal, were built in front of the atrium or at the west end of the church, and contained a baptismal font dedicated to Saint John the Baptist. Beginning with the fourth century the first large baptistries were built, among which was that of Saint John Lateran, said to have been erected by Constantine. In the eleventh century, with the revival of architecture in Europe, superb baptistries were built in Italy and adorned with magnificent decorations. The baptistry of Florence is the most noted for its beautiful internal decorations in mosaic, its dome and its elegant bronze doors ornamented with bas-relief.

Bap′tists, a Protestant sect distinguished by its opinions respecting the mode and subjects of baptism. The name was first applied in 1644 to English congregations who taught that the only true method of baptism is by immersion. The first Baptist church in America was founded at Providence, R. I., in 1639 by Roger Williams. See BAPTISM.

Baptist Young People's Union, THE, of America, was organized July 7, 1891, as a federation of all Baptist young people, without regard to name or organization. Its purpose is to bring all such persons together in a common interest and sympathy in work, to develop Christian character, to increase Scriptural knowledge and to impart a wider missionary outlook. The association is represented by branch societies in nearly every state and territory. The headquarters are at Chicago.

Bar′aboo, WIS., the county-seat of Sauk co., on the Baraboo River and on the Chicago & Northwestern railroad. The city is beautifully located in a fruit-growing district. Its manufactures are aided by good water power, and it has linen and woolen mills and railroad shops. Population in 1910, 6324.

Barbados, *bahr ba′doze,* the most easterly of the West India Islands, situated 78 mi. e. of Saint Vincent. The soil in the lowlands is very fertile, and large crops of sugar cane are raised.

Other important products are cotton, coffee, tobacco, indigo and arrowroot. The leading industries are the manufacture of sugar and rum, but the island has considerable commerce and important fisheries. Barbados is the headquarters for the English forces in the West Indies. The island was discovered in 1518, was occupied by the British in 1625 and has always been a British possession. It is under a governor, assisted by an executive committee; a legislative council and a house of assembly. Bridgetown is the capital. Population in 1900, estimated at 195,000.

Bar'bara, Saint, according to the legend, a saint of Nicomedia, in Asia Minor, who was beheaded by her father for having turned Christian. Her father immediately thereafter was struck dead by lightning. Saint Barbara is invoked in storms, and is considered the patron saint of artillerists.

Barba'rian, a name given by the Greeks to every one who spoke any language but Greek. Originally, it had no unpleasant significance, but naturally, because the Greeks invariably regarded themselves as superior intellectually to any other people, it soon took on something of the modern meaning—rude, uncivilized and illiterate. The Greeks, of course, applied the term to the Romans, who in turn made use of it to designate all who differed from themselves in language and civilization.

Barbaros'sa, a surname given to Frederick I of Germany. It means *Redbeard.*

Bar'bary, a general name for the most northerly portion of Africa, comprising Morocco, Fez, Algeria, Tunis and Tripoli, including Barca and Fezzan. The principal races are the Berbers, the original inhabitants, from whom the country takes its name; the Arabs, who conquered an extensive portion of it during the times of the caliphs; the Bedouins, Jews, Turks and French colonists of Algeria. The country, which was prosperous under the Carthaginians, was, next to Egypt, the richest of the Roman provinces, and the Italian states enriched themselves by their intercourse with it. In the fifteenth century, however, it became infested with adventurers, who made the name of Barbary corsair a terror to commerce, a condition of things finally removed by the French occupation of Algeria.

Barbary Ape, a species of ape, or tailless monkey, with greenish-brown hair. It is the size of a large cat and is common in Barbary and other parts of Africa. Some formerly lived on the Rock of Gibraltar, being the only European monkeys.

Bar'becue, a word of West Indian origin, applied to the practice of roasting whole a hog or other large animal. In the Southern states the word has been extended to signify any open air festivity where animals are roasted whole and great quantities of food and drink are provided.

Bar'bel, a genus of fresh water fishes of the carp family, distinguished by the four fleshy appendages growing from the lips, two at the nose and one at each corner of the mouth, forming the kind of beard to which the genus owes its name. The barbel is common in European rivers and reaches a weight of twenty pounds. It gives good sport to the angler, but its flesh is very coarse.

Bar'ber, one whose occupation is to shave or trim the beard, or cut and dress hair. The practice of surgery was formerly a part of the craft, and by an act of Henry VIII the Company of Barbers was incorporated with the Company of Surgeons—the company being then known as the Barber-surgeons—with the limitation, however, that the surgeons were not to shave or practice "barbery," and the barbers were to perform no higher surgical operation than blood-letting and tooth-drawing. This continued till the time of George II. The sign of the old profession—the pole which the patient grasped, with its spiral decoration in imitation of the bandage—is still retained by barbers. The barbers' shops, always notorious for gossip, were in some measure the news-centers of classic and medieval times.

Barberini, *bahr be re'ne,* a celebrated Florentine family, which, since the pontificate of Maffeo Barberini, who became pope in 1623 as Urban VIII, has occupied a distinguished place among the nobility of Rome. During his reign he seemed chiefly intent on the aggrandizement of his three nephews, of whom two were appointed cardinals, and the third, prince of Palestrina.

Bar'berry, a common shrub, bearing bunches of small, beautiful, nearly oval, red berries. The leaves are serrated and pointed, and thorns, three together, grow upon the branches, with the hanging clusters of yellow flowers. A curious fact about these flowers is that the stamens are held away from the pistils by a fold in the corolla till they are released by the wind or by a passing insect. Then they fly forward and snap their pollen on the stigma. The berries are sour, and when boiled with sugar they make an agreeable preserve or jelly. They are also used as a dry sweetmeat, in sugar plums or comfits they are pickled with vinegar, and they are used for the garnishing of dishes. The bark is said to have medicinal properties, and the inner bark and roots mixed with alum yield a fine yellow dye. The shrub was originally a native of eastern countries, but is now generally diffused in Europe, as also in North America. Numerous other species belong to America and Asia.

Bar'ber's Itch, a disease that effects the face of men, and is so-called because it is often communicated by the implements of the barber shop. It is caused by a parasitic fungus that finds its way into the hair follicles and causes a scarlet eruption, which spreads over the face and is accompanied by severe itching and burning. The disease may be readily cured by killing the parasite.

Bar'ca, a division of North Africa lying between Tripoli and Egypt and bordering on the Mediterranean Sea. It is a province of the Ottoman Empire. The surface is mountainous or an elevated plateau, except near the coast, where there is a belt of arable land. The products are grain, cattle and vegetables. The country also exports ostrich feathers and ivory, which are obtained through caravan trade with the interior. In ancient times Barca formed a portion of Cyrenaica, which in the fourth and fifth centuries rivaled Carthage in prosperity and importance. Bengazi is the capital and chief town. The population does not exceed 300,000.

Barcelo'na, one of the largest cities of Spain, chief town of the province of Barcelona, and formerly capital of the kingdom of Catalonia, situated on the northern portion of the Spanish Mediterranean coast. It is divided into the upper and lower town; the former is modern, regular and stone-built; the latter is old, irregular and brick-built. The city contains a university, a cathedral, a theater—one of the largest in Europe—several public libraries, a museum and a large arsenal and cannon foundry. The principal manufactures are cottons, silks, woolens, machinery, paper, chemicals, stoneware and soap. Its exports are manufactured goods, wine and brandy, fruit and oil; and the imports are coal, textile fabrics, machinery, cotton, fish, hides, silks and timber. Barcelona was governed by its own count until the twelfth century, but was united with Aragon in 1151. In 1640, with the rest of Catalonia, it placed itself under the French crown, and twelve years later it submitted again to the Spanish government. In 1697 it was taken by the French, but was restored to Spain at the Peace of Ryswick. Population in 1900, of commune, including suburbs, 533,000.

Barcelona, a town of Venezuela, situated near the mouth of the Neveri River. The site is very unhealthful. The principal exports are cattle, jerked beef, hides, cotton, cacao and indigo. Population, about 10,000.

Bar'clay, ROBERT (1648–1690), the celebrated apologist of the Quakers, born at Gordonstown, Scotland, and educated at Paris in a school of which his uncle was rector. This uncle promised to make Barclay his heir if he would accept the Catholic faith, but Barclay refused to do this. Later he became a Quaker, because, as he said, he found no charity in either Calvinists or Catholics. In his travels with William Penn and George Fox through England, Holland and Germany, to spread the opinions of the Quakers, he was received everywhere with the highest respect. Among his published works are *Truth Cleared of Calumnies, The Anarchy of the Ranters* and *Treatise on Universal Love.*

Barclay de Tolly, *bahr kli' de to le'*, MICHAEL, Prince (1761–1818), the Russian general who commanded during Napoleon's invasion of Russia in 1812. By his tactics of avoiding open battle and of devastating the country through which Napoleon must pass, he began the reverses which finally ended in Napoleon's defeat. His tactics made him unpopular, however, and his command was taken from him and given to Kutusoff, under whom Barclay served for a time. Restored later to his position, he took a prominent part in the battles of Bautzen, Dresden and Leipzig.

Bard, one of an order among the ancient Celtic tribes, whose occupation was to compose and sing verses in honor of the heroic achievements of princes and brave men, generally to the accompaniment of the harp. The bards of Gaul were known to the Romans two centuries before Christ, but only the tradition of their popularity survives. The first Welsh bards of whose work anything remains, lived in the sixth century, and from that date until the tenth century little is heard of the bards. Edward I of England is said to have hanged all the Welsh bards as promoters of sedition, and on this event is based Gray's ode, *The Bard.* For the preservation of the remains of the ancient Welsh literature, the Cambrian Society was formed in 1818.

Bare'bones Par'liament, the name given to the parliament assembled by Cromwell in 1653, because one of its prominent members bore the name Praise-God Barebones.

Barége, *bah rayzh'*, a light, open tissue of silk and worsted, or cotton and worsted, for women's dresses, originally manufactured near Baréges. In France it is called *crepé-de-barége.*

Bareilly or **Bareli**, *ba ra'le*, a city of India, situated in the Northwest Provinces, 152 mi. e. of Delhi. The town has a pleasant site on an elevated plateau, contains one well-built street, two forts and cantonments and environs for troops. The leading manufactures are swords, ornamental furniture, gold and silver lace and perfumery. The city was seized by the native troops during the Indian outbreak, and the European residents were massacred. It was retaken by Lord Clyde in 1858. Population in 1901, 117,400.

Bareli, *ba ra'le*. See BAREILLY.

Bar'ham, RICHARD HARRIS (1788–1845), an English humorist, the author of the *Ingoldsby Legends*. He was ordained in 1813, in 1821 was appointed a minor canon of Saint Paul's and in 1824 became a priest of the chapel royal. He published several novels and then began his inimitable burlesque metrical tales under the name of Thomas Ingoldsby, which at once became popular from their droll humor, fine irony and varied and whimsical rhymes.

Bar Har'bor, ME., a town and popular summer resort of Hancock co., on the east side of Mount Desert Island, 46 mi. s. e. of Bangor. It ranks as one of the most fashionable summer resorts of the Atlantic coast. Population, about 2000.

Bari, *bah're*, a seaport in South Italy, on a small promontory of the Adriatic, capital of the province Terra di Bari. It was a place of importance as early as the third century B. C. and has been thrice destroyed and rebuilt. The present town, though poorly built for the most part, has a large Norman castle and a fine cathedral. It manufactures cotton and linen goods, hats, soap, glass and liquors. Population in 1901, 72,600.

Bari, a negro people of Africa, dwelling on both sides of the White Nile, and having Gondokoro as their chief town. They follow agriculture and cattle-rearing. Their country was conquered by Sir Samuel Baker for Egypt.

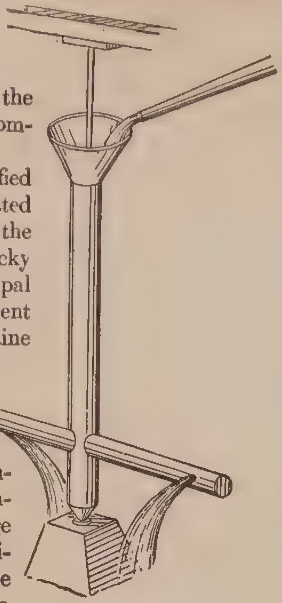
Ba'ring Brothers, the name of a noted British banking firm, the founders of which were Francis and John Baring, sons of a German who settled in England in the first half of the eighteenth century. The house was established in 1770. Through a number of generations the business has descended from father to son, and each head of the house has attained importance in the English government. In 1885 the present head of the house was raised to the peerage as Baron Revelstoke.

Baring-Gould, SABINE (1834–), an English clergyman and author, born at Exeter. He was educated at Cambridge and has held several livings in the English church. Among his works are *Iceland, its Scenes and Sagas, Curious Myths of the Middle Ages, The Origin and Development of Religious Belief, Lives of the Saints,* and the novels, *Mahalah, John Herring, Court Royal* and *The Broom Squire.*

Ba'rium, a metal, found in nature only in compounds, such as the common sulphate and carbonate. Barium was isolated by Davy for the first time in 1808. It is a yellow, malleable metal, which readily oxidizes, decomposes water and fuses at a low temperature. Its nitrate and chlorate are used in making fireworks.

Bark, the exterior covering of the stems of exogenous plants. It is composed of several layers and is separable from the wood. The outside layer is heavy, rough or corky, and usually dead. The innermost layer conveys the foods, and the intermediate green zone has chlorophyll, which manufactures starch here in the same way that it does in the leaves. The outer and inner zones of bark may increase in thickness, but the green layer remains about the same, supplying cells to the outer layer and taking them to the woody interior. The rough and tattered appearance of the barks of some trees is owing to the growth of the interior and to the warping which comes from constant drying and wetting. Many plants produce bark that is valuable in commerce. Cork is gathered from the outer layer of the bark of certain oak trees; tannic acid, the substance which is valuable in tanning leather, is obtained from the bark of hemlock and other trees; quinine is made from Peruvian bark, and the bark fibers of hemp, flax and other plants are made into threads, ropes, mats and cloths.

Bark'er's Mill, a device for illustrating the principle of reaction (See DYNAMICS). It consists of a vertical tube having two horizontal arms attached near the lower end. On one side of each of these arms, near its outer extremity, is a small opening. These openings face in opposite directions. The apparatus is mounted on a frame so that it can rotate. When water is poured into the vertical tube, the reaction of the water jet rushing from the orifices in the arms causes each arm to move backward and thus makes the apparatus revolve. This device is of no practical use in laboratories, but sprinkling machines operated on the same principle are common.



BARKER'S MILL

Barlet'ta, a fortified town in Italy, situated on the west shore of the Adriatic, on a rocky island. The principal buildings are an ancient cathedral of Byzantine architecture, a castle constructed by Charles V, converted into a convent, several churches, and a college founded by Ferdinand IV. In the market place is a colossal statue fifteen feet high, representing the emperor Heraclius. Barletta is nine miles west of Cannae, celebrated for the disastrous defeat of the Romans by Hannibal in the Punic War. Population, 40,388.

Bar'ley, a grain resembling wheat in its general appearance and manner of growth. Barley has been known and cultivated from the earliest times, and beer was made from it by the Egyptians. The chief species are two-rowed barley, four-rowed barley, and six-rowed barley, of which the small variety is the sacred barley of the ancients. In North America the extent of it as a crop is comparatively small; the production in Canada is relatively greater than in the United States, and the Canadian barley is of very high quality. The United States produces about 150,000,000 bushels a year, California, Minnesota, Wisconsin and Iowa, in the order named, being the leading states in its production. Barley is better adapted for cold climates than any other grain, and some of the coarser varieties are cultivated where no other cereal can be grown. Some species are mere grasses. *Scotch barley* is the grain deprived of the husk in a mill. *Pearl barley* is the grain polished and rounded and deprived of the husk and other coverings. *Barley-water*, a decoction of pearl barley, is used in medicine. Barley is also a healthful and nourishing food. See BREWING.

Bar'low, FRANCIS CHANNING (1834–1896), an American soldier and lawyer born in Brooklyn, N. Y. He graduated at Harvard in 1855, enlisted in the New York national guard in 1861 and was promoted to be lieutenant colonel of the Sixty-first Regiment of New York Volunteers in the same year. He became brigadier general and performed distinguished service at Antietam, Chancellorsville and Gettysburg and as commander of a division at Spottsylvania Courthouse. From 1865 to 1868 he was secretary of state of New York and later attorney general of the state, and in the latter capacity had charge of the prosecution of the Tweed Ring. See TWEED, WILLIAM MARCY.

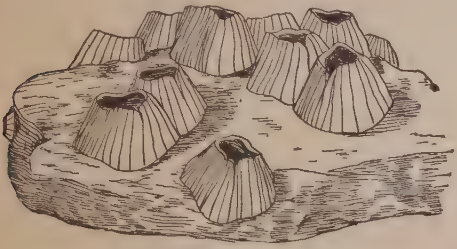
Barlow, JOEL (1754–1812), an American poet, politician and pamphleteer. After an active and changeful life as chaplain, lawyer, editor, land-agent, lecturer and consul, he went to Paris and was active there during the Revolution. On his return to America he was appointed minister plenipotentiary to France, but died near Cracow on his way to a conference with Napoleon. His principal poem, *The Columbiad*, dealing with American history from the time of Columbus, was published in 1807, but it was not successful. *Hasty Pudding*, a mock-heroic poem, met with greater popular favor.

Barmecide's, *bahr'me sidez*, **Feast,** a phrase proverbially used for a feast on imaginary dainties. It originates in the story of the barber's sixth brother, in the *Arabian Nights*.

Bar'men, a city of Germany, situated on the Wupper River, 25 mi. n. e. of Cologne. The town is made up of several small villages, extending along the valley, and on its western boundary it forms a continuation of the town of Elberfeld. The river flows through the center of the town and is crossed by about twenty bridges. Among the important buildings are the municipal theater and the old and new Rathaus. There are also a number of charitable, benevolent and educational institutions, a municipal hospital, a museum of natural history, a library and an art gallery. The chief industry is the manufacture of ribbon, in which Barmen is the leading city of the Continent. Other manufactures are cotton and woolen fabrics, linens, silks, laces, soap, candles, machinery and musical instruments. The location and industries of Barmen make it an important commercial center. Population in 1900, 142,000.

Bar'nabas, the surname given by the apostles to Joseph, a fellow laborer of Paul, and, like Paul, ranked as an apostle. He is said to have founded at Antioch the first Christian community, to have been first bishop of Milan and to have suffered martyrdom at Cyprus.

Bar'nacle, the name of a family of marine crustaceans. They are enveloped by a mantle and shell, composed of five principal valves and several smaller pieces, joined together by a membrane attached to their circumference; and they are furnished with a long, flexible, fleshy stalk, provided with muscles, by which they attach themselves to ships' bottoms, submerged timber, rocks and the like. One species, the *acorn barnacle*, has no stalk, but has a hard, acorn-shaped shell of many leaf-shaped valves. The structure of the barnacle can best be seen in the *goose barnacle*. It has a leathery stalk and six pairs of jointed feet. At the base of the shell is a cement-gland containing a secretion which enables the barnacle to adhere to any substance. These forms are widely distributed and are common in salt waters everywhere. Barnacles feed on small marine animals brought within their reach by the water and secured by their tentacles. Some of the larger species are edible. According to an old fable, these animals produced barnacle geese. See BARNACLE GOOSE.



ACORN BARNACLE

Barnacle Goose, a wild goose common in Europe as a summer visitant in the North Sea. Its forehead and cheeks are white and the upper body and neck black. It takes its name from the absurd belief that it is produced from the barnacles that grow on rocks.

Bar'nard, FREDERICK AUGUSTUS PORTER (1809–1889), an American educator, born at Sheffield, Mass., and educated at Yale College. He began his career as a teacher of the deaf and dumb, but was soon chosen professor of natural philosophy and mathematics in the University of Alabama. In 1856 he was elected president of the University of Mississippi and in 1864 became president of Columbia College (now Columbia University), which position he held for twenty-four years. He was United States commissioner to the Paris Exposition in 1867 and was also associated with numerous astronomical projects and with the United States Coast Survey, being chosen in 1863 to superintend the publication of the maps and charts of that organization. At his death he left most of his property to Columbia College, and Barnard College, affiliated with Columbia University, is named after him.

Barnard, HENRY (1811–1900), an American educator, born at Hartford, Connecticut. He became prominently identified with educational work while he was a member of the state legislature of Connecticut. At that time he was successful in securing the reorganization of the public school system of the state and in introducing many improvements. He was afterwards made state school commissioner and in 1856 founded the *American Journal of Education.* He was one of the leaders in the movement to secure the establishment of a national bureau of education, and became the first commissioner of education of the United States. The most important of his writings are *Hints and Methods for Teachers, Pestalozzi and Pestalozzianism* and *German Educational Reforms.*

Bar'nard Col'lege. See BARNARD, FREDERICK AUGUSTUS PORTER; COLUMBIA UNIVERSITY.

Barn'burn'ers, the name given, in American history, to a faction of the Democratic party in New York state, so-called from their radical tendencies, in allusion to the story of the Dutchman who burned down his barn to clear it from rats. The division of the party was in 1844, the followers of Van Buren being termed *Barnburners,* and those of Polk, *Hunkers.* In 1848, after a contest in the Democratic national convention, the former joined the Free-soilers and voted for Van Buren, and thus made possible the election of Taylor, the Whig candidate. The Democrats were practically reunited in 1852. See DEMOCRATIC PARTY.

Barn'by, SIR JOSEPH (1838–1896), an English composer, born at York and educated at the Royal Academy. He succeeded Gounod as leader of the Royal Albert Hall Choral Society in 1872 and later became musical director at Eton College. During the next twenty years he produced his most noteworthy works, including the oratorio *Rebekah*, a musical setting for *Psalm Ninety-seven*, called *The Lord is King*, and other sacred compositions. He also composed the music to Tennyson's poem, *Sweet and Low.*

Bar'neveldt, Jan van Olden (1547–1619), a Dutch statesman, advocate general of Holland. Largely through his influence, Maurice of Nassau was raised to the stadtholdership, but when Barneveldt saw that Maurice desired to make of the Netherlands a monarchy with himself at the head, he set himself to oppose these ambitious plans. The conflict was disguised under the appearance of a religious controversy, with Barneveldt at the head of the faction known as Remonstrants, and Maurice at the head of the Contra-Remonstrants. Although he had done more for his country than any other man of his generation, Barneveldt was accused of favoring Spain, was arrested, given an unfair trial and beheaded.

Bar'ney, Joshua (1759–1818), an American naval officer, born in Baltimore, Md. In the American Revolution, Barney served with distinction on the *Hornet*, the *Wasp*, the *Virginia* and the *Hyder Ali* and was twice captured, spending many months in prison. Though only twenty-three years of age, he was promoted by Congress to the rank of commodore and received from the State of Pennsylvania a gold-hilted sword. In the War of 1812 Barney was appointed commander of the gunboat flotilla, organized for the defense of Chesapeake Bay. At the Battle of Bladensburg in August, 1814, he distinguished himself, but was severely wounded. For his services at this battle, the city of Washington voted him a sword.

Barnum, Phineas Taylor (1810–1891), an American showman, born at Bethel, Conn. His father was tailor, farmer and tavern-keeper in turn. At thirteen young Barnum was employed in a country store, and about five years afterward went into the lottery business. At nineteen he married secretly and then began to edit the Danbury *Herald of Freedom.*

In 1834 he removed to New York, where he entered upon his first venture as a showman, buying Joice Heth, the reputed nurse of General Washington, and exhibiting her with considerable profit. After 1839 he was reduced again to poverty, but in 1841 he bought Scudder's American Museum in New York, through which he became at once prosperous by exhibiting various fraudulent freaks and curios, and also a noted dwarf (Charles S. Stratton of Bridgeport), whom he styled Gen. Tom Thumb and exhibited in Europe in 1844. In 1847 he offered Jenny Lind $1000 a night for 150 nights, and received $700,000—the concert tickets often being sold at auction, in one case as high as $650 for a single ticket.

Soon, however, he was again bankrupt; but settling with his creditors in 1857, he entered upon new enterprises and made another fortune. In 1866 he was a candidate for a seat in Congress, but was unsuccessful. In 1868 he relinquished the business of showman, resuming it, however, in 1871, when he organized a traveling museum, menagerie and circus, known as the "Greatest Show on Earth," which required 500 men and horses and 100 railroad cars to transport it. In 1879 he estimated the number of his patrons up to date as 90,000,000. He paid $10,000 to the London Zoölogical society for the huge elephant, "Jumbo." Barnum published several books, including an autobiography, which tells frankly of many of his audacious frauds. His principle was to create a public demand by advertising, then to satisfy it, either in truth or by fraud. He once said, "The American people like to be humbugged."

PHINEAS TAYLOR BARNUM

Baro'da, a fortified city of India, capital of the district of Gujarat, 248 mi. n. of Bombay. The trade of Baroda is important, and consists of grain, flax, cotton and tobacco produce. There are several fine buildings and educational institutions. Since 1802 the state has been tributary to Great Britain. Population of town in 1901, 103,800.

Barom'eter, an instrument for measuring the pressure of the atmosphere. There are numerous patterns of barometers, but that in most common use is the *siphon* barometer, illustrated in Fig. 1. This consists of a bent tube of uniform size, having two unequal arms, the longer closed and the shorter open. A quantity of mercury sufficient to fill the longer arm is poured into the tube, and the instrument is set in an upright position. The mercury then takes such a position that the difference in the levels in the two arms represents the pressure of the atmosphere. At sea level, under ordinary conditions, the atmosphere will sustain a column of mercury thirty inches high, and this column is equal in weight to a column of atmosphere having the same area and extending from the earth as far as the atmosphere reaches. Since the atmospheric pressure lessens as altitude increases and the column of mercury gradually lowers in ascending from sea level, a barometer is frequently used to mark the altitude of different localities. The most common use of the barometer, however, is in foretelling the weather. There are mercurial barometers in all stations of the United States Weather Bureau, for this purpose. Since a change of weather follows a change of atmospheric pressure, the rise or fall of mercury in the barometer enables one to foretell in a measure what changes to expect. In making this forecast, one may be guided by the following laws:

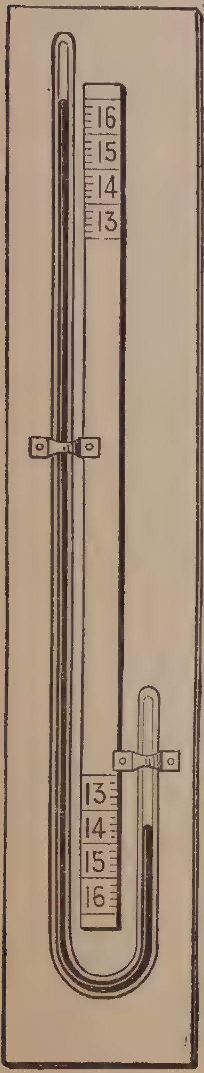


FIG. 1

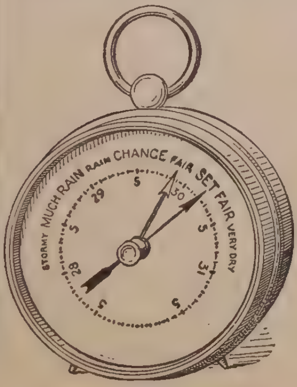


FIG. 2

(1) A rising barometer indicates the approach of fair weather.

(2) A gradually falling barometer indicates the approach of foul weather.

(3) A sudden fall of the barometer indicates the approach of a storm.

(4) A high, unchanging barometer indicates settled fair weather.

Aneroid Barometer. This consists of a flat, circular metallic box, represented in Fig. 2. Within the box is a system of wheel work connected with a needle, which passes over a dial, like the hands of a watch. One side of the box is constructed of such light material that it bends inward with the pressure of the atmosphere, but it is sufficiently elastic to resume its former position when this pressure is removed, or to tend to resume this position as the pressure is lessened. When the barometer is completed the air is exhausted from it and it is then sealed. The motion on the flexible side caused by the variation of pressure moves the needle backward and forward over the dial. When carefully constructed the aneroid is very accurate and it is convenient in measuring altitudes, since it can be carried from place to place with ease and the changes can be read by noting the movements of the needle over the dial.

Barouche, *ba roosh'*, a four-wheeled carriage having a low body, two inside seats facing each other, and an outer seat for the driver. The barouche has a top, which can be lowered and which is often called a falling top.

Barquisimeto, *bahr'ke se ma'to*, a city in the north of Venezuela, capital of the province of Barquisimeto. It was founded in 1522, named New Segovia and is one of the oldest settlements made by the Spaniards in America. It was almost completely destroyed by an earthquake in 1812. Population, about 15,000.

Barr, Amelia Edith Huddleston (1831–), an American novelist, born in England. She was married in 1850 to Robert Barr and four years later went to Texas, where her husband and three sons died of yellow fever. Later she removed to New York. Her first novel, *Romance and Reality*, was published in 1872, and after that time she wrote some thirty novels, among them *Jan Vedder's Wife*, *A Border Shepherdess*, *A Daughter of Fife* and *The Lion's Whelp*.

Barranquilla, *bahr ran ke'lya*, a city of Colombia, South America, situated on the

Magdalena River, 15 mi. from its mouth. The river has been dredged so as to allow sea-going vessels to pass up to the city, which has become an important seaport, as it is the leading center for the interchange of inland products and imports. Population, about 40,000.

Barras', Paul Francois Jean Nicholas Count de (1775–1829), a member of the French National Convention and of the Directory. After serving in the army in India and Africa, he joined the revolutionary party and was a deputy to the States-General of 1789. He took part in the attack upon the Bastille and upon the Tuileries and voted for the death of Louis XVI. In 1795 he was elected president of the Convention and later in the year was made a member of the Directory. From 1797 he governed absolutely until June, 1799, when Sieyès entered the Directory and, in alliance with Bonaparte, procured his downfall. He afterward resided at Brussels, Marseilles, Rome and Montpellier under surveillance, returning to Paris only after the restoration of the Bourbons. His memoirs were suppressed and seized, but they were published recently.

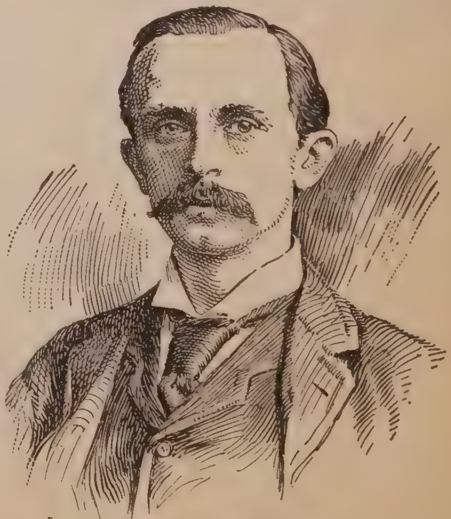
Barre, *bar're,* Vt., a city in Washington co., 6 mi. s. e. of Montpelier, on the Central Vermont and the Montpelier & Wells River railroads. It is one of the most important centers of the granite industry in the United States. Barre was settled about 1788 and was chartered as a city in 1894. It now owns and operates its waterworks. Population in 1910, 10,734.

Bar'rel, a circular vessel bulging in the middle. Barrels are made of thin pieces of wood called *staves,* which are fitted together and arranged around circular boards, that form the ends and are called the *heads.* The staves are held in place by hoops which are driven on tightly. The staves are made wider in the middle than at the ends, and this makes the bulge, which adds strength to the barrel. They also have a groove near each end into which the head, beveled for the purpose, fits. That part of the stave between this groove and the end is called the *chine.* Staves are made of oak and elm, and in barrels for holding liquids they are about three-fourths of an inch thick. Such barrels have a large hole in the middle called the *bung,* which is used in filling and emptying the barrel. Barrels are now made by machinery (See Cooperage).

The barrel as a measure has many different meanings. In wine measure it is 31½ gallons, while in England a barrel of beer means 36½ imperial gallons. As a liquid measure the barrel in the United States is no longer used, but it is used to denote quantities of certain articles sold by weight and frequently packed in barrels. Thus, a barrel of flour must contain 196 pounds, and a barrel of pork or beef, 200 pounds.

Bar'rett, Lawrence (1831–1891), an American actor, born in Paterson, N. J. He made his first appearance on the stage at Detroit, Mich., in 1863, as Murad, in the drama of *The French Spy.* In 1861, at the beginning of the Civil War, Mr. Barrett for a time served as a captain of a company of Massachusetts infantry. Retiring from the army, he again acted in Washington, Philadelphia and New York City. In the last-named place he was advanced to performing Othello to the Iago of Edwin Booth. During 1873 and 1874 he starred in the large cities of the Union. and in 1875 he renewed his connections with Booth in New York City. Later he appeared in *King Lear, Julius Caesar* and Boker's *Francesca da Rimini.* For some years he traveled through the United States in company with Mr. Booth, and he visited Europe several times.

Bar'rie, James Matthew (1860–), a Scottish novelist. His novels, which deal with the homely side of Scotch life, have a peculiar charm by reason of his pathos and humor and his intimate acquaintance with the characters he describes. He has written, among others, *When a Man's Single, A Window in Thrums, The Little Minister, Sentimental Tommy, Tommy and Grizel, Margaret Ogilvy* and *The Little*



JAMES MATTHEW BARRIE

White Bird. Several of his books have been dramatized, and he has written a number of successful plays, among which are *The Professor's Love Story, The Admirable Crichton, Alice-sit-by-the-fire* and *Peter Pan.*

Bar'rier Reef, a coral reef which extends for 1260 miles off the northeast coast of Australia, at a distance from land ranging from ten to one hundred miles. In sailing from Sydney through Torres Straits, vessels have the choice of the inner or outer routes; the former, though narrow, gives a channel of about 12 fathoms deep throughout, and is protected from the sea by the reefs themselves; the outer channel is dangerous.

Bar'ron, James (1769–1851), an American naval officer. As a boy he served in the merchant marine, and in 1798 he was made lieutenant in the navy. In 1807 he was given the rank of commodore and the command of the *Chesapeake.* He was met by the British frigate *Leopard,* whose captain demanded the surrender of several alleged British deserters from among the American crew. To this demand Barron demurred, and the *Leopard* opened fire, killing three and wounding eighteen of the *Chesapeake's* men. The American ensign was hauled down, and the alleged deserters were carried away on the British vessel. The British government promptly repudiated the action of the captain of the *Leopard,* the deserters were restored and a monetary indemnity paid to our government. Barron thereafter was tried by court-martial and suspended from rank and pay for five years. On the expiration of this term he was kept on shore duty. In 1820 Barron killed Commodore Decatur in a duel in which Barron himself was wounded.

Bar'row, a river in the southeastern part of Ireland, in the province of Leinster. It is next in importance to the Shannon and is navigable for 25 miles from the sea.

Bar'row-in-Fur'ness, a seaport and parliamentary borough of Lancashire, England. Its prosperity is due to the mines of red hematite iron ore, which abound in the district, and to the railway, rendering its excellent natural harbor available. It has several large docks, besides graving-docks, a floating-dock capable of receiving vessels of 3000 tons, a large timber pond and other important structures. The chief manufactures are ribbons and other textiles. There are several establishments for calico-printing, famous for the dye called Turkey red. There is an extensive trade in timber, cattle, grain and flour; and iron ore and pig iron are largely shipped. It has numerous blast-furnaces and one of the largest Bessemer-steel works in the world. Besides iron-works, a large business is done in ship-building, the making of railway cars, ropes, sails and bricks. Population in 1901, 57,586.

Bar'rows, John Henry (1847–1902), an American teacher, lecturer and preacher, born at Medina, Mich., and educated at Olivet College, Yale and Andover theological schools, and in Göttingen, Germany. He was pastor of the First Presbyterian church in Chicago from 1881 to 1896. Dr. Barrows conceived the idea of a World's Parliament of Religions in connection with the World's Columbian Exposition and was made its president and organizer. In 1894 he made a tour of the world. In 1898 he was elected president of Oberlin College. He wrote *A History of the Parliament of Religions; Life of Henry Ward Beecher; Christianity, the World's Religion,* and *A World Pilgrimage.*

Barrow Strait, the connecting channel between Lancaster Sound and Baffin's Bay on the east and the polar ocean on the west. It is very deep and has rocky and rugged shores. It was named after Sir John Barrow, a famous British traveler.

Bar'ry, Sir Charles (1795–1860), an English architect, born in London. After executing numerous important buildings, such as the Reform Clubhouse, London, Saint Edward's School, Birmingham, and Manchester's Athenaeum, built in the Grecian style, he was appointed architect of the new Houses of Parliament at Westminster, with the execution of which he was occupied for more than twenty-four years. After this he was knighted and was made a Royal Academician.

Barry, Edward Middleton (1830–1880), the son of Sir Charles Barry, was also a distinguished architect. He succeeded his father as architect of the Houses of Parliament and besides this built Charing Cross, the new Covent Garden Theater and the new National Gallery in London.

Barry, John (1745–1803), an American naval officer, born in Ireland. He was apprenticed to seamanship and became master of a vessel. At the beginning of the Revolution he offered his services to the United States, and in 1776 he became commander of the *Lexington* and captured the British ship *Edward.* In 1777 he captured a British war schooner in the Delaware River, but in the following year, while in command of the *Raleigh*, he was pursued and driven on shore by a British squadron. Later he was transferred to the *Alliance*, and in a severe engagement captured two British ships. He was senior officer, with the rank of commodore, in the reorganized navy in 1794.

Barry, WILLIAM FARQUHAR (1818–1879), an American soldier, born in New York City. He graduated at West Point, served in the Mexican War and in the Seminole War and performed frontier garrison duty until 1861. He entered the artillery service of the Union army, became brigadier general of volunteers and had charge of the artillery of the Army of the Potomac and of the artillery of the defenses of Washington. From 1864 to 1866 he held the same position on the staff of General Sherman, and in the latter year he was brevetted major general of the regular army. During the Fenian raids against Canada, he was in command on the frontier.

Bar′rymore, MAURICE (1847–1905), an English actor and playwright. His true name was Herbert Blythe. He was born in India, educated at Cambridge, England, and early entered upon a stage career. He came to America in 1875 and thereafter spent most of his time here. In 1866 he married Georgiana Drew, the daughter of Mrs. John Drew. He appeared as leading man for many of the greatest actresses of the time, including Modjeska, Langtry and Olga Nethersole, and he was the author of *Nadjeska*, which Madame Modjeska produced in 1884. He was the father of Ethel and Lionel Barrymore.

Bar′ter, a term used in political economy and commerce to denote the exchange of a commodity for another commodity, as distinguished from *sale*, which is the exchange of a commodity for money Barter was the earliest form of exchange and is still in vogue among uncivilized peoples. Most courts now treat the terms barter and sale as interchangeable, though many still consider them as distinct terms.

Barth, HEINRICH (1824–1865), an African traveler, born at Hamburg. He graduated at the University of Berlin in 1844 and in the following year set out to explore all the countries bordering on the Mediterranean. His explorations, which extended over hundreds of thousands of square miles, and his scientific accounts of them, placed him among the foremost African explorers. He published *Travels and Discoveries in Northern and Central Africa*.

Bartholdi, *bahr tole de′*, FREDERIC AUGUSTE (1834–1904), a French sculptor, best known as the artist of the statue of *Liberty Enlightening the World*, now overlooking the harbor of New York (See LIBERTY, STATUE OF). His masterpiece is the *Lion of Belfort*.

Barthol′omew, the apostle, is probably the same person as Nathanael, mentioned in the Gospel of Saint John as one of the first disciples of Jesus. He is said to have taught Christianity in the south of Arabia, but there is nothing to confirm the statement.

Bartholomew's Day, SAINT, a feast of the Church of Rome, celebrated in honor of Saint Bartholomew. What is known as the Massacre of Saint Bartholomew was the slaughter of the French Protestants which began Aug. 24, 1572, by secret orders from Charles IX at the instigation of his mother, Catharine de' Medici, and in which, according to Sully, 70,000 Huguenots, including women and children, were murdered throughout the country. During the minority of Charles and the regency of his mother, a long war raged in France between the House of Guise and the Catholics on the one hand and the House of Condé and the Huguenots on the other. In 1570 overtures were made by the court to the Huguenots, which resulted in a treaty of peace. This treaty blinded the chiefs of the Huguenots, particularly Admiral Coligny, who was wearied with civil war. The king appeared to have entirely disengaged himself from the influence of the Guises and his mother; he invited Coligny to his court, and honored him as a father. The sister of the king was married to the Prince de Béarn (1572) in order to allure the most distinguished Huguenots to Paris. Charles was induced by his mother to believe that Coligny had designs on his life. Accordingly, he consented to help her in her plans the a general massacre of the Huguenots on the night of Saint Bartholomew's day. On that night, at a signal from the tower of the royal palace, the assembled companies of the House of Guise fell on the Huguenots, and the bloody carnival began. Coligny was among the first to fall. Catharine compelled her son to acknowledge before the parliament his sole responsibility for the massacre. The king is said to have died of remorse for his part in the affair.

Bart′lett, SAMUEL COLCORD (1817–1898), an American educator and clergyman, born at Salisbury, N. H., and educated at Dartmouth College and Andover Theological Seminary. He filled successively the positions of pastor of a Congregational church at Monson, Mass., professor of intellectual philosophy at Western Reserve College, pastor of a Congregational church at Manchester, N. H., pastor of the New England church, Chicago, and professor of biblical literature in Chicago Theological Seminary. In 1877 he was chosen president of Dartmouth College, which position he occupied for fifteen years. During his administration the scope of work in the college was greatly enlarged. Besides being a frequent contributor to religious and literary periodicals, he was the author of *From Egypt to Palestine*, *Sources of History in the Pentateuch* and numerous other works.

Bartolommeo, *bahr'to lom ma'o,* FRA (1475–1517), the name assumed by Baccio della Porta, an Italian painter, born at Florence, and a noteworthy member of the Florentine school of painting. He studied under Roselli and came under the influence of Leonardo da Vinci and Raphael, the latter of whom was his intimate friend. Later his visit to Rome caused him to imitate Michelangelo. He was an admirer and follower of Savonarola, on whose death he joined the Dominicans and assumed the name Fra Bartolommeo, but later he was persuaded to take up painting again. The distribution of light and shade and the general arrangement constitute the great merit of his art. In the convent of San Marco are some of Fra Bartolommeo's finished frescoes. Some of his best productions are a picture of Savonarola, *Saint Mark* in the Pitti Palace, *Saint Sebastian* and *Marriage of Saint Catharine*, in the Louvre, and *The Virgin upon a Throne*, in Florence.

Bartolozzi, *bahr'to lot'se,* FRANCESCO (1727–1815), a distinguished Italian designer and engraver, born at Florence. He later went to London, where his best works were produced, and finally went to Lisbon, Portugal, where he died.

Barton, *bahr'ton,* BERNARD (1784–1849), an English poet, known as the Quaker poet. His poetry, though deficient in force, is fluent and graceful and shows a pure religious spirit. It brought him the friendship of Southey, Lamb and Byron.

Barton, CLARA (1826–), an American philanthropist, born in Oxford, Mass., and educated in Clinton, N. Y. She became a teacher, founded a free school in Bordentown, N. J., and became clerk in the United States patent office in 1854. When the Civil War began she devoted herself to the care of wounded soldiers on the battlefield and in 1864 she had charge of the hospitals with the Army of the James. In 1865 she visited Andersonville, Ga., to mark the graves of the Union soldiers. During the war between Germany and France she volunteered her service and was decorated with the golden cross of Baden and the iron cross of Germany. The American Red Cross Society was organized in 1881, and she became its president. In 1884 she represented the United States at the Red Cross Conference in Geneva, Switzerland, and was also a delegate to the International Peace Convention the same year, in that city. In 1883 the United States Senate committee on foreign relations requested her to prepare a *History of the Red Cross.* In 1898 she went to Cuba to distribute supplies furnished by the United States government. In 1904 she resigned the presidency of the Red Cross Society and was succeeded by Mrs. John A. Logan.

Barton, EDMUND, Rt. Hon. (1849–) an Australian statesman, born in Sydney, Australia, and educated at the University of Sydney. From 1883 to 1887 he was speaker of the legislative assembly, and he served later as attorney general and as a member of the federal convention at Sydney in 1891. He was prominent in the movement for Australian federation, and in the first federal cabinet in 1901 he was made minister for external affairs, with the rank of prime minister.

Bar'tram, JOHN (1699–1777), the first great American botanist. He corresponded with Linnaeus and traveled throughout the colonies, making collections and studying the flora. His home was near Philadelphia, and in 1728 he established a botanical garden at Kingsessing on the Schuylkill, the first venture of the sort in America.

Baruch, *ba'ruk,* a Hebrew scribe, a friend and assistant to the prophet Jeremiah, receiving his oracles and reading his prophecies to the people (*Jer.* XXXII, 13; XXVI, 4). One of the apocryphal books bears the name of *Baruch.*

Barye, *ba re',* ANTOINE LOUIS (1795–1875), a famous French sculptor, born at Paris. He began his career as an engraver and goldsmith, but after 1816 he devoted his attention to sculpture, giving much of his time to the study of animals, in which branch of sculpture he achieved fame. His most famous work is his *Tiger Tearing a Crocodile.* He was employed by the architect of the Louvre to make four groups for the pavilion. Barye received many honors, becoming a member of the Institute and an officer of the Legion of Honor.

Bary'ta, oxide of barium, called also *heavy earth,* from its being the heaviest of the earths. It is generally found in combination with sulphuric and carbonic acids, forming sulphate and carbonate of barium, the former of which is called *heavy spar.* Baryta is a gray powder, has a sharp, burning taste and a strong affinity for water, and forms a hydrate with that element. With the acids it forms white salts, all of which are poisonous except the sulphate. Several mixtures of sulphate of barium and white lead are manufactured and are used as white pigments; sulphate of barium may be used alone. Carbonate of barium, which in the natural state is known as *witherite,* is also used as the base of certain colors. The nitrate is used in the preparation of green fireworks.

Basalt', a well-known igneous rock occurring in the ancient trap and the recent volcanic series of rocks, but most abundantly in the former. It is a fine-grained, heavy, crystalline rock, consisting of feldspar, augite and magnetic iron and olivine. Basalt is very common in regions that have been disturbed by volcanic action. Its tendency to crystallize in columns gives a peculiar character to the scenery. The columns are four-sided, six-sided or eight-sided, and are usually jointed. Fingall's Cave on the island of Staffa, the Giant's Causeway, Ireland, and the cliffs along the Columbia River in Washington are noted illustrations of basaltic columns. See IGNEOUS ROCKS.

Bas'com, JOHN (1827–), an American educator, born at Genoa, N. Y., and educated at Williams College and Andover Theological Seminary. On completing his education he was appointed professor of rhetoric at Williams College, which position he held for nineteen years, when he was chosen president of the University of Wisconsin in 1874. In 1887 he retired from this position and became professor of political science at Williams College, where he remained until 1901, when he retired. Among his most important works are *A Textbook of Political Economy, The Principles of Psychology, The Growth of Nationality in the United States* and *God and His Goodness.*

Base, in chemistry, a chemical compound which will unite with an acid to form a salt. The metal of the base takes the place of the hydrogen of the acid. A base may be an oxide, as calcium oxide or lime, or a hydroxide (hydrate), as potassium hydroxide. The union of a base and an acid usually destroys the properties of both. In some cases, however, not all the hydrogen of an acid is replaced by the metal of a base, and the salt formed may have acid properties.

Base'ball, a game played with ball and bat, which has attained a national character in the United States, where dozens of professional leagues play daily throughout the summer season, and the games of a single league during a single season have been witnessed by nearly 2,500,000 spectators. Every college and high school has its baseball team, and on the vacant lots in every city, baseball games contribute to the development of the street urchin's muscles and wit. Everybody seems to know baseball slang, and the spectators at every game try to encourage their favorite team and to unsettle the nerves of their opponents by shouting or "rooting." Baseball is an excellent game, for it requires fleetness of foot, quickness and accuracy in catching and throwing the ball; gives every player an opportunity to distinguish himself and requires the exertion of keen intelligence, especially in cooperating with team-mates in a play.

HISTORY. The game probably originated in the English game of rounders, though simpler games employing ball and bat, such as one-old-cat or town ball, were played in the United States before baseball. Prior to 1842 no such game as our modern baseball was known, and its development has been altogether American. It was introduced into England in 1874, later into Australia and, to some extent, into Japan. In 1845 the Knickerbocker Club of New York drew up the first set of rules for the game, and between 1857 and 1871 a national association supervised the rules. During the War of the Rebellion baseball was played in both armies with enthusiasm, and the soldiers returning home communicated their interest to all sections of the Union. Soon the National Association, an openly professional league, was organized, but because of its gambling operations was supplanted after five years by the present National League. This league, together with the American League, which appeared in 1900, has since guided the development and formulated the rules of the game. Recently it has become the practice for the winners of the two leagues to play a series of games in October, for the world's championship.

RULES OF THE GAME. A baseball field should be over 100 yards square. Ninety feet from the center of one side of the field is the white rubber slab (See *h,* Fig. 1), called the *home plate.* The *diamond* consists of a square 90 feet on a side, its three corners occupied by the canvas bags or *bases,* which are known in succession from right to left as first base, second base and third base. In Fig. 1 the distances are all marked in feet. The lines which appear on the field are drawn solid, and those which are merely of assistance in laying out the field are dotted. Fig. 2 is an enlarged view of the home plate, with dimensions in feet and inches, and it shows, as well, the dimensions of the boxes within which the batsmen must stand. White chalk lines (*a a* in Fig. 1) indicate the position beyond which the player who is coaching, or advising, the base runner may not pass; and others (*b b*), the points beyond which the players waiting for their turns at bat shall not advance. The lines from the home plate to the first base and from the home plate to the third base are continued and known as foul lines (See Fig. 1), to guide the umpire in determining whether the batted ball is fair or foul, it being the latter if it strikes outside the foul line. It is customary to indicate by flags on the fence surrounding the grounds, or on poles in the ground far out in the field, the extremities of the foul lines. The ball is hard but elastic, 3 inches in diameter and weighs 5 ounces. The bat is of ash or some other elastic wood, tapering from a diameter of 2½ inches to a size convenient for the hands, and usually about 34 inches long. Balls and bats used by nonprofessional teams and by younger players may be smaller and lighter. Each team consists of nine players. One nine is *at bat*, trying to run around the bases and make the scores upon which victory depends, while the opposing side is *in the field*. At intervals, when three batsmen are *out*, the teams change places, until each side has been at the bat nine times; that is, has had nine *innings*. If, for any reason, a game is stopped before four and a half innings have been played by either side, it is considered no game. If more than four and a half innings have been played, then the side which was ahead at the last even inning wins. If a game is a tie at the end of the ninth inning, play is continued until one side is ahead of the other at even innings or until the game is stopped by the umpire. The team in the field consists of three divisions: the *battery*, the *infield* and the *outfield*. The positions of these men will be easily understood by consulting Fig. 1. The battery consists of the *pitcher*, who stands at the rubber slab (2) and throws the ball over the plate, within reach of the batsman's bat, but so swiftly or deceptively as to elude it if possible; and the *catcher* (1), who guards the home plate, catches the ball when it is not hit and returns it to the pitcher. The catcher is protected against glancing balls by a wire mask, an inflated chest protector and a heavily padded hand mit. The infield consists of a *first baseman* (3), a *second baseman* (4), a *shortstop* (5) and a *third baseman* (6). The outfield consists of a *right fielder* (7), a *center fielder* (8) and a *left fielder* (9). These men wear lightly padded gloves and are expected to catch the balls hit by the batsman. They do not always occupy the positions shown in the diagram, but move about according to the habits of the pitcher and batsman, especially noticing whether the batter is right or left-handed, and watching attentively any runners who may occupy bases.

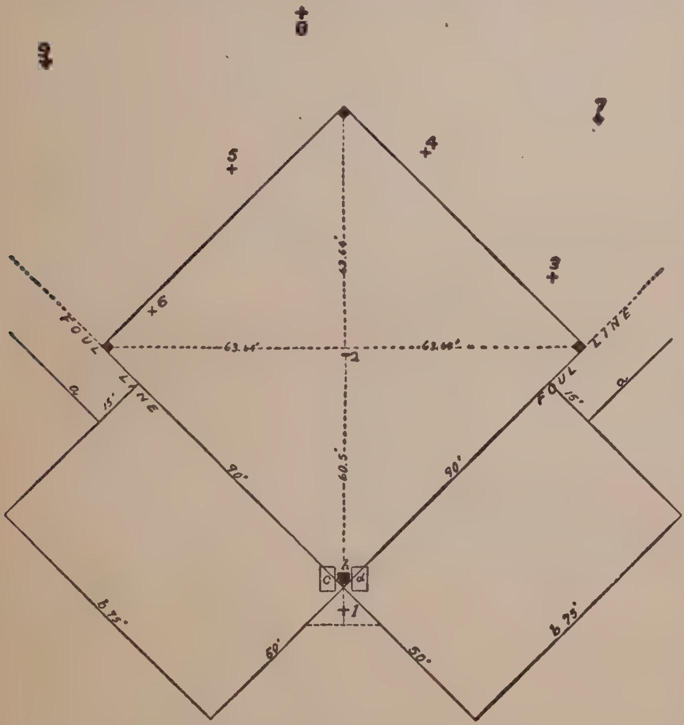


FIG. 1

The batter, who stands at *c* or *d* (Fig. 1), tries to knock the swiftly pitched ball into the field between the lines of the first and third bases, and out of reach of his opponents. An umpire watches the ball as it is pitched, and when it appears to pass over the plate higher than the batter's knees and below his shoulders, calls a *strike*, whether the batter strikes at such a ball, hits it foul or fails to strike at it. The third strike, however, cannot be called on a foul ball. After three strikes, the batsman is out and gives place to another player unless the catcher fails to catch the ball on the third strike and the batsman reaches first base before the ball. Pitched balls which do not pass over the plate or which do not pass at the right height, are called *balls*, and after four such balls the batsman is allowed to occupy first base unmolested. Having made a fair hit, the batsman becomes a baserunner and tries to make a circuit of the bases. If he reaches home after touching first, second and third bases in succession, he scores a point for his side. If the hit is caught on the "fly," or if the ball is held by an opponent on first base before the runner reaches that point, or if the runner while between bases is touched by the ball in the hands of an opponent, he is out. Once having reached first base, however, he cannot be put out while in contact with a base unless he is "forced off" that base by a following runner. When three men are out, the inning is complete.

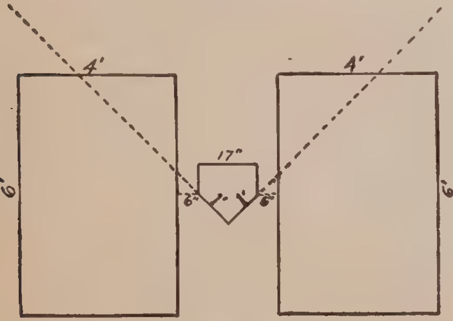


FIG. 2

There are many minor rules, some of which change from year to year, but which are so thoroughly advertised in the daily papers and the numerous books of rules that no one interested in the game need remain ignorant of them. While the greatest skill and judgment are perhaps demanded of the pitcher, yet the catcher and every fielder and baseman must have a peculiar fitness for his position. The infielder must have a quick eye to take a ground ball at the right point; and the outfielder to chase a fly ball and be at the right spot to catch it as it falls. Every player cultivates a habit of throwing the ball the instant he receives it. Underhand throwing usually saves time on ground balls, but does not give such speed or accuracy as overhanded throwing. The pitcher may throw the ball at different speeds, so as to deceive the batsman; may place it close to the handle of the bat, where it cannot be knocked far; or may throw it so that it will curve in or out or rise or drop. The advantages of the curved ball are that it is hard to hit squarely, and is exceedingly deceptive for the batsman. The catcher studies the weak points of every batsman and signals for the balls which the batsman finds it most difficult to hit. See ATHLETICS.

Basedow, *bah'ze do,* JOHN BERNHARD (1723–1790), a German educator. The chief feature of Basedow's system of pedagogy is the full development of all the faculties of the young. He established a school called the *Philanthropinum,* where he attempted to apply his ideas. His pupils had eight hours for sleep, eight hours for food and recreation and eight hours for study. Basedow did not prove to be a good organizer, and his school did not succeed.

Basel, *bah'zel,* a city of Switzerland. It is 43 miles north of Berne, and consists of two parts on opposite sides of the Rhine, connected by three bridges. It has an ancient cathedral, founded in 1010, containing the tombs of Erasmus and other eminent persons; a university, founded in 1459; a seminary for missionaries, and a museum containing the valuable public library and pictures. The industries embrace the manufacture of silk ribbons, paper and aniline dyes, tanning and brewing. Basel is the most important manufacturing and commercial city in Switzerland. Here was signed the treaty of peace between France and Prussia, and that between France and Spain, both in the year 1795, and here was held an ecumenical council in 1431 (See BASEL, COUNCIL OF). Population in 1900, 109,169.

Basel, COUNCIL OF, an ecclesiastical council, held at Basel from 1431 to 1449, summoned by Pope Martin V. Soon after the Council had constituted itself, the new pope, Eugenius IV, requested the cardinal legate, Cesarini, to dissolve it and call one a little later at Bologna. The Council refused to dissolve and proceeded to transact business. Its main objects were the union of the Greek and Latin churches, a compromise with the Hussites and the institution of certain reforms within the Church. The Council was, on the whole, a failure.

Bash'i-Bazouks', irregular troops in the Turkish army. They are mostly Asiatics and have had to be disarmed several times by the regular troops, on account of the barbarities by which they have rendered themselves infamous.

Ba'sic Slag, the slag or refuse matter which is obtained in making basic steel, and which, from the phosphate of lime it contains, is a valuable fertilizer. See STEEL.

Basil, *baz'il*, a plant of the mint family, native of India but cultivated in Europe and the United States. It is much used in cookery, especially in France.

Basil'ica, among the Greeks and Romans originally a public hall of justice or a courthouse in which the magistrates administered justice. It was generally oblong in shape and was adorned with rows of columns, which divided it into aisles, the middle one being the widest and having at the end a semicircular or square apse, in which the tribunal was placed (See APSE). The basilicas gradually became market places and exchanges, and at the beginning of early Church history, some of them were changed into Christian churches. Various modifications were from time to time introduced, until they were very different from the original form.

Basilisk, *baz'i lisk*, a fabulous creature, variously regarded as a kind of serpent, lizard or dragon. It inhabited the deserts of Africa, and its breath, and even its look, was fatal. The name is now applied to a species of harmless lizards, distinguished by an elevated crest or row of scales, which, like the dorsal fins of some fishes, runs along the whole length of the back and tail. The *mitered* or *hooded basilisk* is especially remarkable for a membranous bag at the back of the head, of the size of a small hen's egg, which can be inflated with air. The other species have such hoods, but of a less size.

THE MYTHICAL BASILISK

Ba'sil the Great (about 330–379), a theologian, the founder of Eastern monasticism, born at Caesarea. He received a thorough education, after which he became closely identified with the social life of Caesarea, but soon directed his energies to religious work. For a number of years he subjected himself to the severest denials, which gave him wide reputation among the leaders of the Church. He was made presbyter of Caesarea in 364, and later he was appointed bishop of Caesarea and Cappadocia. He was noted for his great courage and strict adherence to his belief, which caused him several prolonged controversies of a theological nature. He possessed excellent literary ability and wrote many letters and works of a theological nature. Of these the *Nicene and Post-Nicene Fathers* has been translated into English.

Basin, in physical geography, the whole tract of country drained by a river and its tributaries. The line dividing one river basin from another is the *watershed*; the various watersheds divide each country into its river basins. The basin of a lake or sea consists of the basins of all the rivers which run into it.

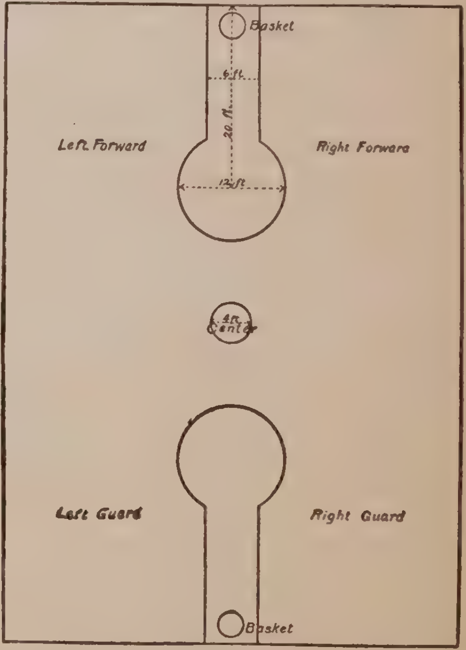
In geology a basin is any dipping or disposition of strata toward a common axis or center, due to upheaval and subsidence. It is sometimes used almost synonymously with "formation," to express the deposits lying in a certain cavity or depression in older rocks.

Bas'ket, a vessel made by weaving together twigs, splints, leaves, grass or wire. The most common baskets are made from thin, flat strips of wood, called *splints*. Ash, oak, elm and birch are the woods most frequently used. The splints for handmade baskets are obtained by beating the logs with a heavy maul until the wood readily splits into thin pieces. The splints are then cut to the proper width, finished and soaked in water until they can be bent to any desired shape. Twigs of the willow are used for making many kinds of baskets and for baby carriages, chairs and other articles of furniture; in Holland, Germany and France the growing of willows for basketry constitutes an important industry. In the United States baskets used for marketing fruit are made by machinery and the sides and bottom are often of one piece. See BASKETRY.

Bas'ket Ball, an American winter game that has in recent years come into great popularity with both sexes in their gymnasiums. It was invented in 1891 by James Naismith, and rapidly found its way into the schools and colleges, and thence into general athletic associations, especially those fostered by the Young

Men's Christian Associations and the militia companies. The game is one of the best possible for athletic development, as it calls for great quickness, agility and endurance, besides compelling quickness of perception and rapidity of thought. No one can be a good basket ball player who does not throw his whole soul into the sport, and who has not perfect control of his muscles. Basket ball is the winter substitute for baseball and football, and it has many advantages for boys and men, in that it does not call for the highly specialized skill of baseball, nor for the great strength of football.

The field should be large enough to give free and unimpeded action to the ten men who compose the team, should be longer than broad, and should not cover more than 3500 square feet of actual playing space. The accompanying diagram shows how the field should be laid out, and gives the dimensions of the required lines. The heavy lines of the diagram should be painted in black on the floor of the gymnasium. At the center of each end of the field is a basket 18 inches in diameter, whose rim is 10 feet from the ground, and 6 inches away from the rigid, smooth supporting surface back of it. This smooth surface, or background, must be at least 6 feet horizontally and 4 feet vertically, and must extend not less than 3 feet above the top of the basket. The round ball, which must not be more than 32 nor less than 30 inches in circumference, is an inflated rubber bladder covered with a leather case. Each team is composed of five men; two known as *forwards*, two as *backs* or *guards* and one as the *center*. The game is played in two halves of limited time, each opposing team defending one of the baskets. The object of the game is for members of one team to throw the ball into the basket of the opposing team. Each time a "basket" is so thrown during actual play, two points are scored. In case a "foul" is called by an official against any member of a team, a designated player from the other side may have what is called a "free throw;" that is, he stands in the center of the circle, twenty feet from the basket, and has a right to throw the ball if possible into the opponent's basket without any interference or interruption from the other side, all the players being kept outside the circle and the lane shown in the diagram. A basket so thrown counts one point for the side making it. At the beginning of the game the centers from the opposing team stand within the central four-foot circle, each facing his opponent's basket. The refereee takes the ball and tosses it into the air so it will come down between the two centers, each of whom endeavors to strike or obtain possession of the ball. From the moment the ball is thrown, play is begun. The men follow the ball over the field, all trying to get possession of the ball so as to throw it into the basket nearest the forwards when the game started, or pass it on to a forward to their own side, who may have an opportunity to make the basket. The business of the backs, or guards, is to prevent the forwards of the other team from throwing a basket, and to get the ball and pass it to their own forwards. There is fine chance for team work in the game, and a well drilled team has its signals by which players are informed as to the general course of the play, if it is not broken up. The ball may be caught, thrown or struck with the open hand, but no person having caught the ball can take more than one step with it. The ball must not be kicked or struck with the foot or body, and when caught it must be held entirely by the hands. Opponents must not touch the body of the person carrying the ball if they can avoid it, but they may interfere with his throwing it in many ways. If the ball goes outside the boundary lines, a player of the side opposite to the one who forced the ball outside has a right to throw it to a member of his team inside,



or in case of doubt, the official may decide to throw it up between two opposing players at the spot where it crossed the line. At any time when the ball is held by two players of an opposing side, the referee throws it up between them, as in the center at the opening of the game. The game is governed by special rules, which vary somewhat from year to year and which provide for the various emergencies that may arise and determine what shall be considered fair or foul play and what penalties shall be assessed. Using the fist, kicking, striking, shouldering, tripping and unnecessary roughness are all barred. See ATHLETICS.

Bas′ketry, the art of basket-making (See BASKET). Basketry is among the simplest of the mechanic arts, and wherever uncivilized races have been found, their women are seen to be skillful in weaving textiles into baskets, cloth and matting. Among all uncivilized tribes this work bears evidence of more or less skill, but as far as known, the American indians excel all others in the variety, designs and finish of their baskets, and it is from them that many of the most useful and beautiful designs have been obtained.

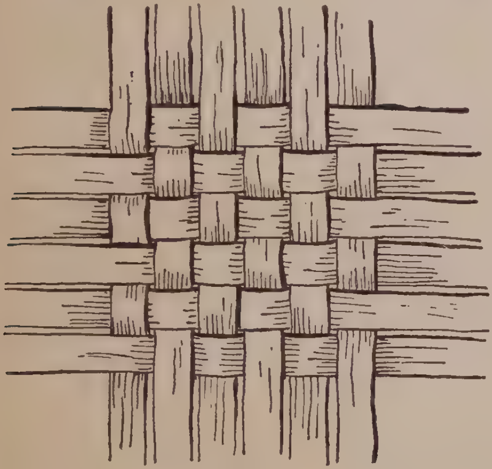


FIG. 1

MANUFACTURE. The manufacture of baskets includes gathering and preparing the material as well as fashioning it into the finished article. The processes involved and the labor necessary depend upon the material used and the kind of baskets that are to be made from it. All baskets, according to their construction, can be divided into two classes, woven baskets and coil baskets.

Woven Baskets. The simplest form of woven basketry and that in most general use for large baskets is *checker work*, in which the splints cross at right angles, each splint of the "weft" running alternately above and below the splints of the "warp." This style of weaving is employed with both large and fine splints, but more frequently with the larger ones. See Fig. 1.

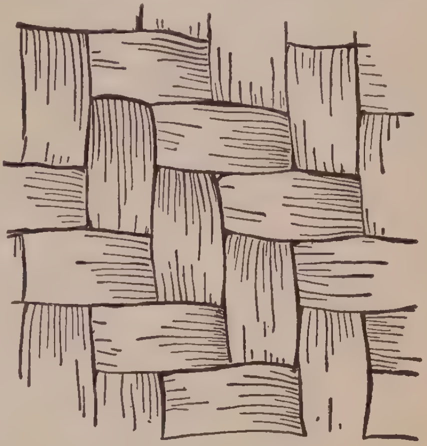


FIG. 2

The style of weaving common in baskets made of cane is known as *twill work*. This consists in passing each splint of the weft over two or more splints of the warp, then under two, forming a diagonal or twilled pattern. These patterns are subject to a great variety of changes. See Fig. 2.

Another common style is the *wicker work* so frequently seen in willow baskets. This also is subject to a great variety of changes and patterns and is often combined with twilled work, for which it forms borders. See Fig. 3.

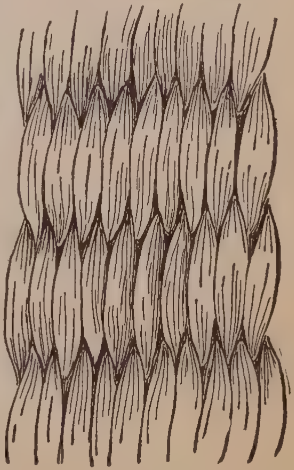


FIG. 3

The style of weaving common among the indian tribes of the Rocky Mountains and all along the Pacific coast is *twined work*. This is the most intricate and also the most beautiful of all styles of weaving. The warp consists of rigid rods or splints, and the weft is in pairs or in three-strand, twining and braiding in threes. In passing from rod to rod of the warp, the weft strands are twisted in half-turns. Twined work is subject to many changes of pattern and some of the most beautiful basketry is made in this way. See Fig. 4. In Fig. 5 is shown the plan of starting a basket in three-strand braid and twined work.

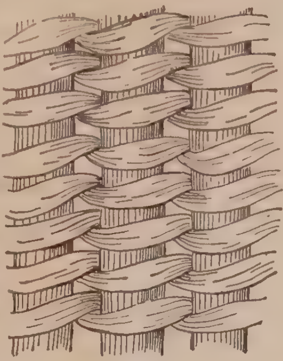


FIG. 4

Coiled Baskets. Coiled baskets are made by sewing over and over with some sort of flexible material, each stitch interlacing with the one underneath. What corresponds to the warp in the woven work is of a coarser and a more rigid material, and a fine, flexible bark is used for the sewing. This style of basketry is very popular in what is known as *raffia* work in the schools. There are many varieties of coiled work and the variety of production is equally great. Among the indians specimens of coiled baskets have been found so small that they would pass through a lady's finger ring, while others are larger than an ordinary barrel. This plan of basketry admits of the use of a finer and more flexible material than is generally employed in woven work, and for this reason more beautiful and delicate results can be obtained. The stitches may be coiled openly, forming what is known as *openwork*, shown in Fig. 6, or they may be coiled about a body of one or more rods or splints. Fig. 7 shows a very common pattern, in which the stitches are coiled around three rods. By varying the form of the stitch the basket-maker introduces bands and thus breaks the monotony of the surface, adding to the grace and beauty of the basket.

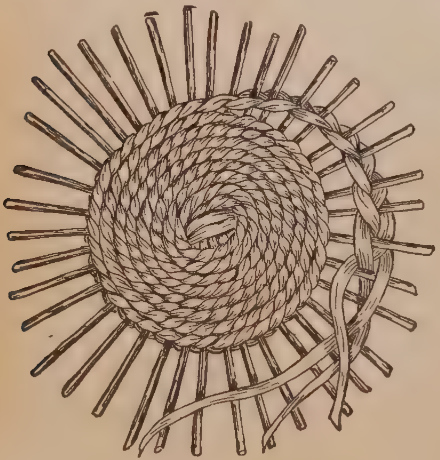


FIG. 5

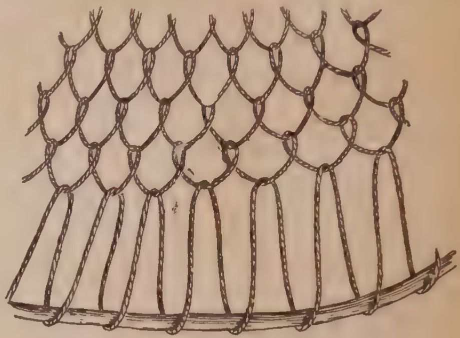


FIG. 6

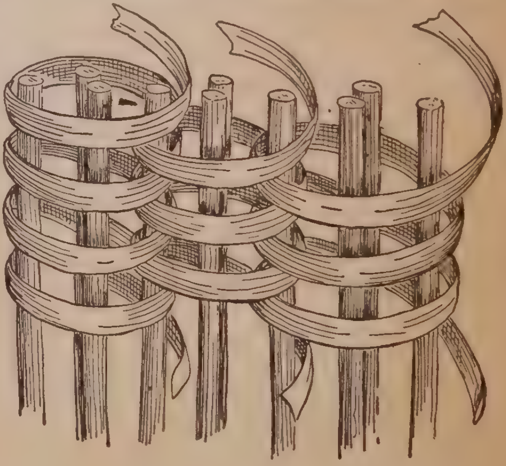
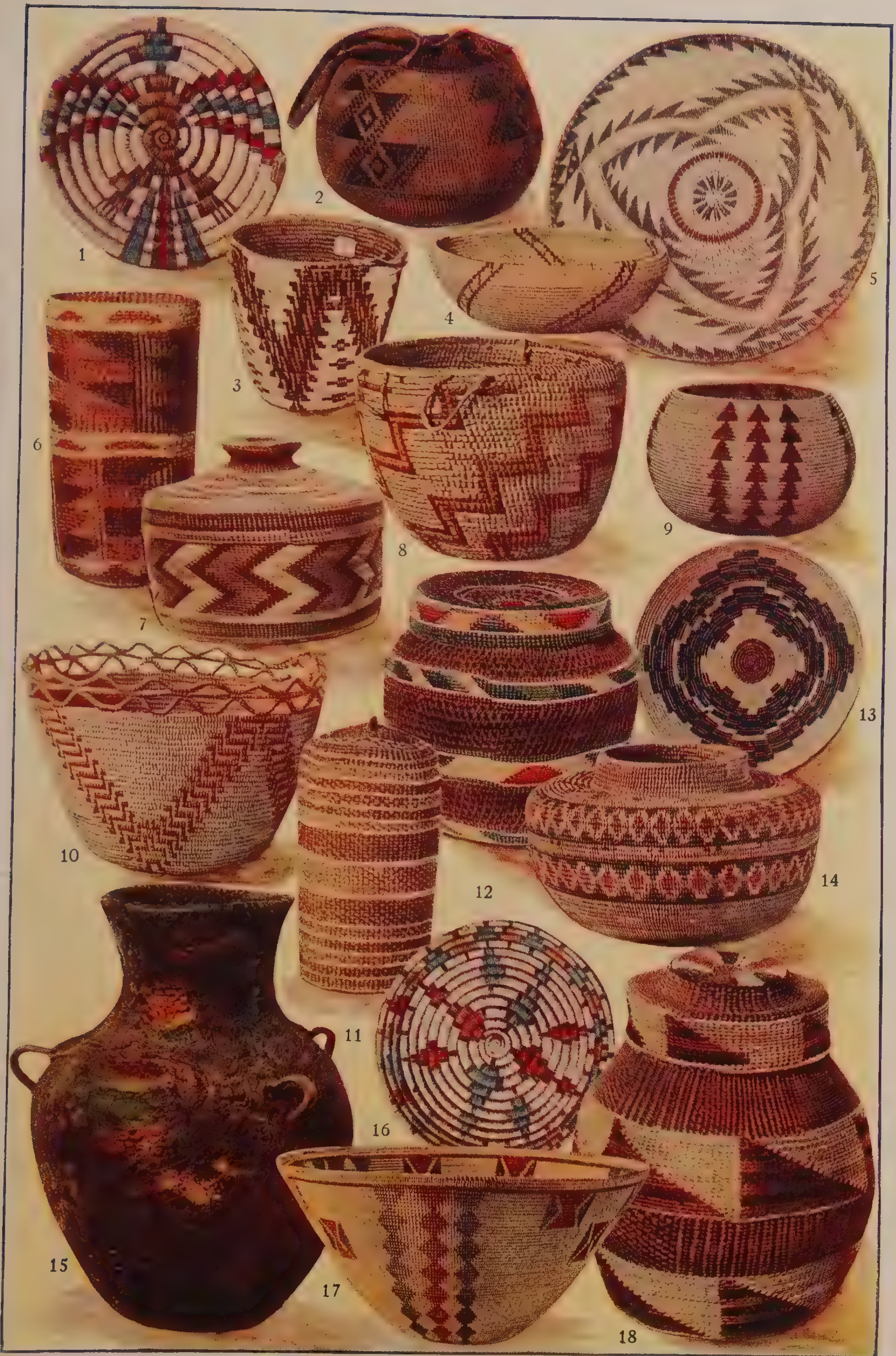


FIG. 7

Basketry forms a very useful and valuable occupation for a portion of the industrial work in schools. It is simple, easily learned and excellent for training both the hand and the eye. Consult Mary White's *How to Make Baskets* and *More Baskets, and How to Make Them.*

Basque, *bask,* a remarkable race of people, dwelling partly in the southwestern corner of France, but mostly in Spain near the Pyrenees.



INDIAN BASKETRY

1 and 16, Hopi Coiled Plaques.
2, Oregon and California Twined Basket.
3, Klikitat Imbricated Basket.

4 and 9, Washo Basket Bowls.
5, Klamath Gambling Tray.
6, 7 and 11, Tlinkit Twined Baskets
8 and 10, Salish Imbricated Baskets.
12 and 18, Tlinkit Covered Baskets.

13, Mission Indian Coiled Plaque.
14, Tulare Coiled Jar.
15, Apache Ancient Water Jar.
17, Panamint Coiled Bowl.

They preserve their ancient language, manners and national dances, and make admirable soldiers, especially in guerrilla warfare. Ignatius Loyola, Saint Francis Xavier and other famous men were natives of the Basque provinces.

Basra, *bahs'rah.* See Bassora.

Bas-relief, *bah re leef',* (or low relief) is the mode of sculpturing figures to give them a slight projection from the background. Strictly speaking, the height should be less than half of the thickness of the figure. The frieze of the Parthenon at Athens has the most famous examples of bas-reliefs in the world. See Alto-Rilievo; Mezzo-Rilievo.

Bass, the name given to several species of fresh water and some salt water fishes. The *large-mouthed black bass* and the *small-mouthed black bass* are among the best game fishes of the United States. The former are more plentiful in lakes, while the latter prefer clear water and running streams. Both species vary considerably in color, those in clear water being much lighter and brighter and frequently thought to be entirely different fishes from their relatives of dark water. In most states they are protected by law through the greater part of the year. They are taken with light rods and tackle and make a vigorous fight for liberty.

BLACK BASS

There are also numerous fresh water species of less value. Among these are the *white bass,* found in the vicinity of the Great Lakes, the *striped bass* or *rock fish* of the Atlantic coast, from Florida to the Gulf of Saint Lawrence, and the *yellow bass,* found in the lower Mississippi. Most of the other species of fishes called bass belong to the perch family.

Sea bass common along the southern Atlantic coast are known in various localities as *red-fish, red-horse* or *red-drum,* from the reddish-brown color. They sometimes attain a weight of fifty pounds. The lips are tough, the fins large and the scales so big that in the largest specimens they are removed with a hoe. Smaller ones run in companies and go by the name of *school bass,* while the larger ones are found in pairs or singly and are called *channel bass.* All species are excellent food and highly esteemed. The sea bass found around Catalina Island off the coast of California often attain a weight of 300 to 400 pounds.

Bass, *base,* or **Basso,** *ba'so.* See Music.

Basse-Terre, *bas tare',* the capital of Saint Christopher, one of the West India Islands, is situated on the south side of the island on the mouth of a small river. It has a good harbor and is a seaport of some importance, since the surrounding country yields abundant crops of sugar cane and tropical fruits. The town was destroyed by fire in 1867 and rebuilt on a modern plan. Population, about 9000.

Bas'sia, a genus of tropical trees found in the East Indies and Africa. The fruit of one species yields a kind of butter that is highly valued and forms an important article of commerce in the interior of Africa. There are several other species, of which the Indian oil-tree and the Indian butter-tree are well-known examples. The wood is as hard and durable as teak.

Bassoon', a musical wind instrument of the reed order, consisting of four tubes, blown through a bent metal mouthpiece. The tubes are holed and keyed like the clarinet. For convenience of carriage the instrument is divided into two or more parts, whence its Italian name *fagotto,* a bundle. It serves for the bass among wood-wind instruments, as oboes and flutes. Its compass comprehends three octaves, rising from B flat below the bass staff.

Bassora, *bahs'so ra,* or **Basra,** a city in Asiatic Turkey, on the west bank of the Shat-el-Arab, about 50 mi. from its mouth and 270 mi. s. e. of Bagdad. The city is one of great commercial importance. The chief exports are dates, camels and horses, wool and wheat. The ruins of the ancient and more famous Bassora, founded by Caliph Omar in 636, at one time a center of Arabic literature and learning and regarded as "the Athens of the East," lie about 9 miles southwest of the modern town. Population, estimated at 20,000.

BASSOON

Bass Strait, a channel beset with islands and coral reefs, which separates Australia from Tasmania. It is 150 miles wide and was discovered by George Bass, a surgeon in the royal navy, in 1798.

Bass′wood, Bass or **Lin′den,** a large, handsome tree, with big, rounded leaves, common in North America. It yields a light, soft timber, used for building boats and canoes and for small carved and turned objects. The flowers are strongly fragrant and rich in honey, so that the tree is a favorite with bee-keepers.

BASSWOOD

Bastia, *bas te′a,* the former capital of the island of Corsica, upon the northeast coast, 75 mi. n. e. of Ajaccio. This is the wealthiest and most populous town in the island. Population in 1901, 23,660.

Bastien-Lepage, *bas tyaN′ le pazh′,* Jules (1848–1884), a French painter. At an early age he showed an inclination for painting, and after taking several prizes for drawing he went to Paris to study, where he attended the Ecole des Beaux Arts. Among his works are the *Song of Spring, Portrait of My Grandfather,* which brought him fame, *The Hay-makers, Joan of Arc Listening to Voices* and *The Forge.*

Bastille, *bas teel′,* a French name for any strong castle provided with towers, but as a proper name, the state prison and citadel of Paris, which was built about 1370 by Charles V. It was ultimately used chiefly for the confinement of persons of rank who had fallen victims to the intrigues of the court or the caprice of the government, and thus was regarded as a symbol of oppression. The capture of the Bastille by the Parisian mob, July 14, 1789, was the opening act of the Revolution. The mob first attempted to negotiate with the governor, Delaunay, but when these negotiations failed, began to attack the fortress. For several hours they continued their seige without being able to effect anything more than an entrance into the outer court of the Bastille; but at last the arrival of some of the Royal Guard with a few pieces of artillery forced the governor to let down the second drawbridge and admit the populace. The governor was seized, but on the way to the town-hall he was torn from his captors and put to death. The next day the destruction of the Bastille commenced. To-day a bronze column marks the site of the Bastille, while the anniversary of its destruction is celebrated as the national holiday of France.

Basu′toland, a native province and British possession of South Africa, sometimes called the Switzerland of South Africa. It is bounded on the n. w. by Orange River Colony; on the s. and s. e. by Cape Colony and on the n. e. by Natal. The country was opened to missionaries before 1869, and since that date the people have made rapid advancement in civilization. In 1866 the Basutos, who had lived under a semi-protectorate of the British since 1848, were proclaimed British subjects, and in 1871 the province was joined to Cape Colony. In 1879 the native tribes caused a revolt which the Cape forces were unable to put down, and, finally, in 1884, when peace was restored, Basutoland was separated from Cape Colony and is now governed by a resident commissioner under the high commissioner of South Africa. The region, mainly barren or shrubby, is mountainous, and it has several peaks which rise to the height of 10,000 feet. Population, in 1907, 351,000.

Bat, one of the group of wing-handed, flying mammals, of the order chiroptera, having the fore limbs peculiarly modified so as to serve for flight. Bats are animals of the twilight and darkness and are common in temperate and warm regions, but they are most numerous and largest in the tropics. All European bats are small and have a mouse-like skin. The body of the largest British species is less than that of a mouse, but its wings stretch about fifteen inches. During the day it remains in caverns, in the crevices of ruins, hollow trees and other lurking places, and flits out at evening in search of food, which consists of insects. Several species of the same genus are common in North America.

Many bats are remarkable for having a curious growth on the nose, shaped something like a horseshoe. In some bats these growths resemble leaves, and in one species the entire nose looks like a flower. The eyes in most bats are very small, but they are remarkably keen. Bats may be conveniently classified in two sections: the flesh-eating, comprising all European and most African and American species, and the fruit-eating, belonging to tropical Asia and Australia, with several African forms. At least two species of South American bats are known to suck the blood of other mammals, and hence they are called *vampire bats* (See VAMPIRE BAT), though the name has also been given to a species not guilty of this habit. As winter approaches, in cold climates bats seek shelter in caverns, vaults, ruined and deserted buildings and similar retreats, where they cling together in large clusters, hanging head downward, and sleep until the returning spring recalls them to life. The *brown bat* of the United States, the *heavy bat* of the Eastern states, the *big-eared bat* of the Mississippi valley, the *leaf-nosed bat* and the *lyre bat* are common species. See FOX BAT.

Batangas, *ba tahn'gas,* a town on the island of Luzon, Philippine Islands, capital of the province of Batangas, situated 50 mi. south of Manila. The town is well built and contains good stores and many elegant homes. Previous to the Spanish-American War, Batangas enjoyed a prosperous trade, which has not yet been fully restored. The town is in the midst of one of the richest sugar-producing districts in the Philippines, but the industry is not fully developed. The production of cocoanut oil is also an important industry. Population, 39,358.

Bata'via, a city and seaport of Java, on the north coast of the island, the capital of all the Dutch East Indies. It is situated on a wide, deep bay, the principal warehouses and offices of the Europeans, the Java Bank, the exchange and other business buildings being in the old town, which is built on a low, marshy plain near the sea, intersected with canals. The Europeans reside in a new and much healthier quarter. Here is located one of the most beautiful botanic gardens in the world. Batavia has a large trade, sugar, coffee, rice and indigo being the chief exports. It was founded by the Dutch in 1619 and attained its greatest prosperity in the beginning of the eighteenth century. Its inhabitants are chiefly Malay, with a considerable mixture of Chinese and a small number of Europeans. Population, 115,567.

Batavia, N. Y., the county-seat of Genesee co., 36 mi. e. of Buffalo, on Tonawanda creek and on the Erie, the Lehigh Valley and the New York Central railroads. It is in a farming region and has manufactories of agricultural implements, shoes, firearms and other articles. The state institution for the blind is here, and the city has a public library which is a memorial to William Morgan, who became famous during the Anti-Masonic excitement in 1826. Batavia was founded by Joseph Ellicott in 1801. Population in 1910, 11,613.

Bate'man, NEWTON (1822–1897), an American educator, born at Fifield, N. J., and educated at Illinois College and Lane Theological Seminary. He began his career as professor of mathematics in Saint Charles College. In 1858 he was elected state superintendent of public instruction for Illinois, and he held the position for ten years, during which time he was largely influential in establishing the school system and shaping the educational policy of the state. In 1875 he became president of Knox College.

Bates, ARLO (1850–   ), an American author, born in Maine. He graduated at Bowdoin College, and after editing the Boston *Sunday Courier,* in addition to other literary work, he became professor of English literature at the Massachusetts Institute of Technology. He has written *Love in a Cloud, The Diary of a Saint* and other novels; poems, some of which are collected in *Under the Beech Tree;* critical *Talks on Writing English,* and a volume on the study of literature.

Bates, EDWARD (1793–1869), an American statesman, born in Virginia. He studied law and practiced in Missouri, becoming attorney general of the state. He served a term in Congress, 1827–1828, and was then and thereafter a prominent opponent of the slavery party. He received forty-eight votes on the first ballot in the Republican convention of 1860, but withdrew in favor of Abraham Lincoln, who afterward made him attorney general of the United States.

Bates, JOHN COALTER (1842–   ), an American soldier, born in Fort Charles co., Mo. He was educated at Washington University, Saint Louis, entered the Union army at the opening of the Civil War, served in the Army of the Potomac and on the staff of General Meade from the Battle of Gettysburg to the close of the war, being brevetted major and lieutenant colonel. He served in the regular army after the war, and at the outbreak of the Spanish-

American War was made brigadier general of volunteers, becoming major general of volunteers before the end of the Santiago campaign. He was for a time military governor of a department in Cuba, but was transferred to the Philippines, where he conducted several successful campaigns. In 1902 he was made major general of the United States regulars and in 1906 became lieutenant general of the army, succeeding General A. R. Chaffee. General Bates was a member of several special army boards, notably that which adopted the present system of drill, and another which adopted the Krag-Jörgensen rifle for use in the army.

Bath. The use of the bath is, as might be anticipated, an exceedingly old custom. Homer mentions the bath as one of the first refreshments offered to a guest; thus, when Ulysses enters the palace of Circe, a bath is prepared for him, and he is anointed after it with costly perfumes. In later times, rooms, both public and private, were built expressly for bathing, the public baths of the Greeks usually being connected with gymnasiums. The fullest details we have with respect to the bathing of the ancients apply to its luxurious development under the Romans. Their bathing establishments consisted of four main sections, the undressing room, with an adjoining chamber in which the bathers were anointed; a cold room with provision for a cold bath; a room heated moderately to serve as a preparation for the highest and lowest temperatures, and the sweating-room, at one extremity of which was a vapor-bath, and at the other, an ordinary hot bath. After going through the entire course, both the Greeks and the Romans made use of strigils or scrapers, either of horn or metal, to remove perspiration, oil and impurities from the skin. Connected with the baths were walks, covered race grounds, tennis courts and gardens, the whole, both in the external and internal decorations, being frequently on a palatial scale. The groups of the Laocoön and the Farnese Hercules were both found in the ruins of Roman baths.

At the present time the bath commonly in use in Russia consists of a single hall, built of wood, in the midst of which is a powerful metal oven, covered with stones and surrounded with broad benches, on which the bathers take their places. Cold water is then poured upon the heated stones, and a thick, hot steam rises, which causes the perspiration to issue from the whole body. The bather is then gently whipped with wet birch rods, rubbed with soap and washed with lukewarm and cold water; of the latter, some pailfuls are poured over his head, or else he leaps, immediately after this sweating-bath, into a river or pond, or rolls in the snow. The Turks, by their religion, are obliged to make repeated ablutions daily, and for this purpose there is in every city a public bath connected with a mosque. A favorite bath among them is a modification of the hot-air bath of the ancients, introduced generally under the name of *Turkish bath* into other than Mohammedan countries. A regular accompaniment of this bath, when properly given, is the operation known as "kneading," generally performed at the close of the sweating process, after the final rubbing of the bather with soap. It consists in a systematic pressing and squeezing of the whole body, the stretching of the limbs and the manipulating of all the joints, as well as the fleshy and muscular parts of the body (See MASSAGE).

Public baths are common in the United States, every large city having a number of baths fitted up in artistic style for the use of well-to-do patrons Besides these, there are free public baths for the poor. The gymnasiums at colleges and high-schools have baths where the athletes may bathe after exercise, and at many of the public schools bathing privileges are afforded the pupils. In various parts of the country are hot springs and medicinal springs, where large sanitariums have been erected for the invalids who flock to the springs to bathe. Among the most famous are those at Hot Springs, Garland co., Ark., resorted to by invalids for the cure of rheumatism and similar complaints. There are from seventy-five to one hundred springs, varying in temperature from 105° to 160°, issuing from a lofty ridge of sandstone overlooking the town, while others rise in the bed of the stream near by. The most celebrated natural hot baths in Europe are those of Aix-la-Chapelle, Karlsbad and Baden in Germany; Toeplitz, in Bohemia; Bagnières, Barèges and Dax, in the south of France, and Spa, in Belgium.

Cold baths are invigorating and stimulating and should be taken in the morning unless followed by a chill; warm baths are restful and quieting and may be taken at any time; hot baths are weakening and should be taken at night, or only when it is possible to rest for a long time after them. There is a great difference in the effects of baths upon different individuals, and every person should be observant for himself. A cold morning bath of the neck and chest is a good preventive of "taking cold."

Bath, a city of England, situated on the Avon 100 mi. w. of London. The location is in a narrow valley, and the town has beautiful surroundings. The most interesting building is the Abbey Church, which is considered one of the finest specimens of perpendicular Gothic architecture in Europe. Bath is celebrated for its hot springs, which have strong medicinal properties. These springs yield about 200,000 gallons of water a day. The city was founded by the Romans, who named it Aquae Solis, meaning the *waters of the sun*. The town reached the height of its influence and prosperity under the leadership of Beau Nash in the eighteenth century and became a very fashionable resort. It is now, however, more of a health resort. Population in 1901, 49,817.

Bath, Me., the county-seat of Sagadahoc co., 35 mi. s. of Augusta, on the Maine Central railroad and on the Kennebec River, 12 mi. from the ocean. There is an excellent commercial port and a large ocean trade. Ship-building is the chief industry, but there are also foundries, machine-shops and boiler-works, and manufactures of lumber, oilcloth, woolen goods and shoes. The first settlement was probably made by a missionary to the indians about 1660. The town was incorporated in 1781, and a city charter was secured in 1847. Population in 1910, 9396.

Bathom'eter, an instrument for measuring the depth of sea beneath a vessel without casting a line. It consists of a vertical steel tube of small bore, having a cup-shaped expansion attached to its lower end. This is closed with a corrugated steel plate which forms a diaphragm. The tube and cup are filled with mercury, which rises and falls with the varying depth of the water. The change in the height of the column of mercury is indicated on a micrometer scale which is read through a microscope. The instrument works on the principle that the land exerts stronger attraction than the water, and that this power diminishes according to the law of gravitation; that the force of attraction between bodies decreases as the square of the distance between them increases. When the vessel is in shallow water, the mercury is drawn down with greater force and the column lowers; as the water deepens it rises. A perfect instrument will indicate a difference of a fathom in depth.

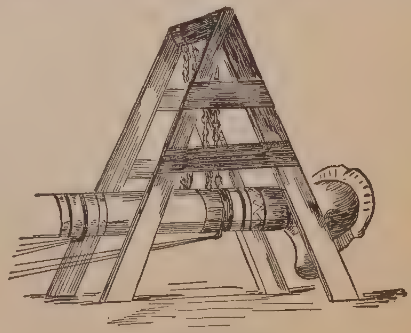
Baton Rouge, *bat'on roozh,* La., the capital of the state, 89 mi. n. w. of New Orleans, on the eastern bank of the Mississippi River and on the Yazoo & Mississippi Valley and the Texas & Pacific railroads. It is a picturesque city, built on a bluff above the river, and has many quaint old houses of French and Spanish styles. The manufactures include lumber and cotton products, brick, sugar and ice. It was one of the earliest French settlements in Louisiana. The state university, penitentiary, agricultural experiment station, and several charitable institutions are located here. Population in 1910, 14,897.

Batoum, *ba toom'.* See Batum.

Batrachians, *ba tra'ke anz,* the name given originally to an order of animals between the snakes and fishes. See Amphibians.

Battal'ion, in the United States, a body of troops consisting of four companies of infantry, usually commanded by a major. As the battalion is rather too large a unit to be directed by one commander in the field, the company bids fair to displace it in battle. An artillery battalion includes from two to four batteries.

Bat'tering-ram, an engine for battering down the walls of besieged places. The ancients employed two different engines of this kind—one suspended in a frame, the other movable on wheels or rollers. Each consisted of a beam or spar with a massive metal head, and was set in motion either by a direct application of manual force or by means of cords passing over pulleys. Some are said to have been 120 feet or more in length and to have been worked by 100 men. One is described as being 180 feet long and having a head weighing 1½ tons. They were generally covered with a roof or screen for the protection of the workers.



BATTERING-RAM

Bat'tery, in artillery, the name applied to an organization within a company, which includes as many guns as can be commanded by a single officer. Batteries vary widely in size and style, according to the service for which they are designed. In the field artillery the battery usually consists of six guns, along with the commanding officer, gunners, horses and drivers. In the navy the term applies to all of the guns of a ship. The term is also sometimes applied to a group of large guns within a fortification, or mounted for the purpose of defending a position. See ARTILLERY.

Battle, TRIAL BY or WAGER OF. During the Middle Ages, when a man was accused of a crime he might appeal to the court for the privilege of proving his innocence by fighting his accuser. It was believed that God would fight on the side of the man who was in the right, and thus the judgment was held to be absolutely just. If the accused or the accuser was a woman, she might choose a champion to fight in her stead. The custom was later prohibited by law.

Bat′tle Creek, MICH., a city in Calhoun co., 160 mi. e. of Chicago, at the junction of the Kalamazoo River and Battle Creek, and on the Michigan Central, the Chicago and Grand Trunk and the Cincinnati Northern railroads. There are a number of mills and manufactories, but the city has become best known by the many establishments for the manufacture of foods. It is the headquarters of the Seventh Day Adventists, who maintain a college, a publishing house, a health-food factory and one of the largest sanitariums in the world. The country is agricultural and raises considerable fruit. Battle Creek became a city in 1860. Population in 1910, 25,267.

Battle of the Nations. See LEIPZIG, BATTLES OF.

Bat′tleship. See WAR SHIP.

Batum or **Batoum,** *ba toom′*, a Russian port on the eastern coast of the Black Sea, granted to Russia by the Treaty of Berlin in 1878. The harbor is one of the best on the east coast of the Black Sea. An extensive trade is carried on, Batum being the chief commercial center for the export of petroleum, wheat and manganese ore. Its importance as a naval and military station to Russia is very great, as it has one of the strongest positions on the Black Sea. Population, 28,512.

Baucis, *baw′sis*, **and Philemon,** *fil′e mon*, an aged couple with whom a famous old myth was connected. One evening Jupiter and Mercury, who were visiting the earth in disguise and had been driven from an inhospitable village, came, beyond the bounds of the village, to the cottage where Baucis and Philemon lived. The strangers, although unrecognized, were kindly received and were given the best that the cottage afforded. While they were at supper, Baucis and Philemon observed, to their great amazement, that the pitcher from which the milk was poured was constantly refilled as soon as empty. This showed them the divine character of their guests.

Baudry, *bo dre′*, PAUL JACQUES AIME (1828–1886), a prominent French painter. The decoration of the foyer of the New Opera House at Paris was intrusted to him, and this work is considered among the most brilliant creations of modern art. His best painting is *The Glorification of the Law.*

Bauxite, *boke′site*, the mineral from which aluminum is obtained. It has a coarse, granular structure and is of various colors. It occurs in clay-like deposits and is usually mixed with a greater or less proportion of oxide of iron. Large deposits are found in Ireland and in the United States in Arkansas, Alabama and Georgia. The American deposits are pure and well suited to the production of aluminum. See ALUMINUM.

Bava′ria (German, *Bayern*), a kingdom of the German Empire, consists of two separate portions, the eastern, or Bavaria proper, and the western, or Rhenish Bavaria. Eastern Bavaria is bounded on the n. by Prussia, Saxe-Meiningen, Saxe-Coburg-Gotha, Reus and Saxony, on the e. and s. by Austria and on the w. by Wurtemburg and Baden. Rhenish Bavaria is bounded on the n. and w. by Prussia and Hesse-Darmstadt, on the e. by Baden and on the s. by Alsace-Lorraine. The total area of the kingdom is 29,282 square miles, or a little less than that of South Carolina. Next to Prussia, Bavaria is the largest state of the German Empire.

Nearly all of the boundary lines are formed by mountain ranges, and the country is generally mountainous or hilly. The interior is a plateau having an average elevation of 1600 feet and gradually sloping toward the north. Rhenish Bavaria is traversed by the Harz Mountains, which have an elevation of over 3200 feet..

The country is drained by the Danube, which traverses it from west to east and receives as tributaries the Iller, Lech, Isar and Inn from the south, and the Warnitz, Althmul, Naab, Regen and Vils from the north. The Main and its tributaries drain the northern part. In the southern part are numerous mountain lakes famed for the beauty of their scenery.

The important minerals are coal, iron, salt, graphite and lithograph stone. About 25,000,000 tons of coal are mined each year, but with this exception mining operations are limited.

Agriculture is the leading industry, and Bavaria is the most important agricultural state of the Empire. There are many agricultural associations, through which the farmer's work is organized. These assist in the purchase of seed, agricultural machinery, and in the marketing of products and other movements tending to the farmer's prosperity. The most important crops are rye, wheat, barley, oats, potatoes, hay and grapes. The raising of live stock is also an important industry, and some of the best breeds of cattle found in the world are produced in Bavaria. About one-third of the country is covered with forests, all of which, whether belonging to the state or to private individuals, are under the supervision of the government.

Bavaria is the largest beer-producing country in the world, and beer is its most important manufactured product. Other leading manufactures are linens, woolens, cottons, leather, paper, glass, iron ware, jewelry and scientific instruments.

The leading exports are beer, textiles and scientific instruments. The imports are food products and manufactures. The chief cities are Munich, the capital, and Augsburg, Nuremberg, Wurzburg and Ratisbon.

The government is a constitutional monarchy. The king is the chief executive and is assisted by a council of state of six ministers. The parliament, known as the *Landtag*, is composed of two houses, the upper known as the Chamber of Councilors of the Realm, and consisting of 80 members, and the lower, or Chamber of Deputies, consisting of 159 members, elected by the people for six years. The elective franchise is restricted to property holders. Bavaria is represented in the national parliament by six members in the *Bundesrat* and by 48 in the *Reichstag*. For the purpose of local government, the kingdom is divided into eight districts, each of which is subdivided into administrative districts. Each district has its local legislature, which is made up of representatives elected for six years. In regard to its internal affairs the kingdom is entirely independent.

HISTORY. Bavaria is the home of the Celtic tribes known as the Boii and was for a long time a Roman province. During the reign of Charlemagen it came under the sway of the Franks, and after his death it was ruled by lieutenants having the title of margrave. In the latter part of the twelfth century the country came under the rule of the Wittelsbach family, which, with few interruptions, has continued to rule to the present time. The present constitution was adopted in 1818, but owing to the inability of the ruler did not secure the benefits which the people expected until about 1850. Bavaria opposed the movement towards a united Germany under the leadership of Prussia, and in 1866 sided with Austria in the Austro-Prussian War. As a result she was compelled to cede a portion of her territory to Prussia and pay a large indemnity. She also entered into an offensive and defensive alliance with Prussia, and this compelled her to side with Germany in the war with France. On the conclusion of this war she took a leading part in the formation of the German Empire. Population in 1900, 6,168,392. See GERMANY.

Bax′ter, RICHARD (1615–1691), the most eminent of the English nonconforming divines of the seventeenth century, was born of poor parents and received his education largely in a course of private study. He was ordained in 1638, and in 1640 he became parish clergyman of Kidderminster, where he soon became a very popular preacher. On the breaking out of the Civil War he went to Coventry and ministered to the garrison, and later he was chaplain in one of the regiments. He condemned the execution of the king and the election of Cromwell. At the Restoration he became king's chaplain. In 1685 he was arrested and imprisoned by Judge Jeffreys and released after two years. He left about 150 treatises, of which his *Saints' Everlasting Rest* and *Call to the Unconverted* have been the most popular.

Bay, the name, rightly, of the laurel tree, noble laurel, or sweet bay; but the term is often loosely given to many similar trees and shrubs. A fatty oil, used in veterinary medicine, and a volatile oil are obtained from the berries. Superstitions have always been connected with the bay tree. In England the leaves are used in Christmas decorations, and they were once thought to be a safeguard from lightning. Sprigs of laurel or bay were in ancient times worn as a signal of victory. See LAUREL.

Baya, *bah′ya*, an interesting weaver bird which lives in the East Indies. It builds a nest resembling a bottle, which it suspends from the branch of a tree. The entrance is from beneath, and there are two chambers, one occupied by the male and one by the female. The baya is a very intelligent bird, is easily tamed, and is often taught by the natives to fetch and carry and do other entertaining tricks.

Bay'ard, James Asheton (1767–1815), an American statesman, born in Philadelphia. He graduated at Princeton in 1784, studied law in Philadelphia, was admitted to the bar in 1787 and settled in Wilmington, Del. In 1796 he was elected to Congress as a Federalist and in 1804 was made United States senator. He served till March 3, 1813, and as a Federalist opposed the declaration of war against Great Britain in 1812. In 1814 President Madison appointed him a commissioner, with Albert Gallatin and John Quincy Adams, to negotiate a peace with Great Britain. He was appointed minister to Russia, but declined the office. His two sons, Richard Henry and James A., were successively senators from Delaware, and his grandson, Thomas F., was senator from 1869 to 1884.

Bayard, Pierre du Terrail (known as *Chevalier Bayard*) (1476–1524), a French knight, the model of all the virtues of chivalry. He served under the French kings Charles VIII, Louis XII and Francis I, and under all of them he achieved wonderful successes over the Italians, Spaniards and English. One of his most famous exploits was the defense of a bridge at Garigliano, in 1503, against the assaults of two hundred Spaniards. The brilliant victory at Marignano, 1515, was won largely through his efforts, and Francis I bowed before him after the victory to receive knighthood from him. His valor, his generosity and his unblemished honor won for him the name of *Chevalier sans peur et sans reproche* (the knight without fear and without reproach).

Bayard, Thomas Francis (1828–1898), an American statesman, born at Wilmington, Del. He studied law and established a reputation as an able attorney. He was opposed to the Civil War and took no part in it, but in 1869 he was elected United States senator, serving till 1884. In 1885 he was made secretary of state in President Cleveland's cabinet. He served with credit, though he was not tested by very important questions. In 1893 he was appointed ambassador extraordinary and plenipotentiary to England.

Bay City, Mich., the county-seat of Bay co., on the Saginaw River, 4 mi. from Saginaw Bay and on the Michigan Central, the Pere Marquette and other railroads. It has large steel shipbuilding plants and an extensive trade in lumber, salt, coal and manufactured articles. There are a number of fine buildings, including the city hall, Masonic Temple, First Presbyterian church and the United States government building. West Bay City and Bay City practically form one town, although they have separate governments. Bay City was settled in 1836 and was incorporated in 1859. Population in 1910, 45,166.

Bayeux, *ba yö'*, an ancient town in France, in the department of Calvados, 16 mi. n. w. of Caen. In its cathedral, said to be the oldest in Normandy, was preserved for a long time the famous Bayeux tapestry (See Bayeux Tapestry). The manufactures are lace, calico and porcelain. Population in 1901, 7312.

Bayeux Tapestry, a celebrated piece of embroidery of early medieval times, giving in a series of pictures the history of the invasion and conquest of England by the Normans. It is supposed to have been worked by Matilda, wife of William the Conqueror, and her attendants. It contains over fifteen hundred figures, with inscriptions in Latin; it is 230 feet long and about twenty inches high. The tapestry was found in the cathedral at Bayeux and is still kept in the library at Bayeux, having been preserved in a fine condition.

Bay Mahog'any, that variety of mahogany exported from Honduras. It is softer and less finely marked than the variety known as Spanish mahogany, but it is more abundant and the trees are of larger size. See Mahogany.

Bay'onet, a sword-like blade attached to the end of a musket and used principally in repelling a cavalry charge. At first the bayonet, which was invented sometime in the seventeenth century, was thrust into the gun barrel, but very soon was improved so as to fit around the barrel and thus cause no interruption to firing. Before modern long-range weapons were introduced, fighting at the point of the bayonet was common, but recently its usefulness in this respect has been questioned. Formidable knife bayonets and combinations of bayonets and entrenching tools are in use in the United States infantry.

Bayonne, *ba yon'*, a fortified town of France, situated near the coast about 3½ mi. from the Bay of Biscay. It has an excellent harbor, guarded by three lighthouses at its entrance. The important buildings are a cathedral begun in 1213, a theological seminary and a naval school. The leading industries are sugar refining and the manufacture of linen goods, leather, cream of tartar and brandy. There are also glass factories, foundries and shipyards. An extensive trade is carried on with Spain and Portugal and the South American countries. Bayonne is the ancient Lapurdum and was a commercial center as early as the third century. Population (of commune), 27,600.

Bayonne, N. J., a city in Hudson co., on New York and Newark bays, and on the New Jersey Central railroad. The largest refinery of the Standard Oil Company is located here, and the other industries include chemical, boiler and smelting works and electric launch, wire and silk factories. The residence section contains many fine homes of New York business men. The city was formed by the union of several former villages and was first chartered as a city in 1869. Population in 1910, 55,545.

Bayreuth, *bi'roit.* See BAIREUTH.

Bay Rum, a liquid prepared by dissolving the oil of bay in alcohol, diluting the solution with water and adding a small quantity of the oil of orange peel and of allspice. The oil of bay is obtained by distilling the leaves of a tree belonging to the myrtle family, growing in the West Indies. Bay rum is used for toilet purposes and in medicine as a liniment.

Bay Win'dow, a window forming a bay or projecting section of a room, and rising from the ground or basement on a plan rectangular, semioctagonal or semihexagonal, but always straight-sided. The term is, however, also often used to designate a bow window, which more properly forms a semicircle, and an oriel window, which is supported on a kind of bracket and is usually on the first floor.

Bazaine, *ba zane',* FRANÇOIS ACHILLE (1811–1888), a marshal of France. He took part in the Crimean War and in the expedition to Mexico for the purpose of making Maximilian, archduke of Austria, emperor. In the latter part of the Franco-German War he had command of the main French armies, and after a succession of defeats he took refuge in Metz, which in October, 1870, he was obliged to surrender, with 173,000 men. He was tried by a court-martial and sentenced to be shot, but his sentence was commuted to twenty years' imprisonment. In 1874 he escaped from prison.

Bazar or **Bazaar,** *ba zahr',* in the East, an exchange or market-place, usually consisting of small shops or stalls in a narrow street or series of streets. A bazar is sometimes covered and sometimes open. Markets for the sale of miscellaneous articles, chiefly fancy goods, are now to be found in most European cities, bearing the name of bazars.

The term bazar is also applied to a sale of miscellaneous articles, mostly of fancy work, contributed gratuitously, in the furtherance of some charitable or other purpose.

Bdellium, *del'le um,* an aromatic gum resin, brought chiefly from Africa and India, in pieces of different sizes and shapes, externally of a dark reddish brown, internally clear and not unlike glue. To the taste it is slightly bitterish and pungent, but its odor is agreeable. The ancients regarded it highly as a medicine, but it is not now used for that purpose.

Bea'consfield, EARL OF. See DISRAELI, BENJAMIN.

Beagle, *be'gl,* a small hound, formerly kept to hunt hares, now displaced by the harrier, which sometimes is called beagle. The beagle is smaller than the harrier, compactly built, smooth-haired, with pendulous ears. The smallest of them are little larger than the lapdog.

Beam, a long, straight and strong piece of wood, iron or steel, used generally in an important place in a structure to support a weight. The term has several technical applications. (1) In a balance it is the part from the ends of which the scales are suspended. (2) In a loom it is a cylindrical piece of wood on which weavers wind the warp before weaving; also, the cylinder on which the cloth is rolled as it is woven. (3) In a ship it is one of the strong transverse pieces stretching across from one side to the other to support the decks and retain the sides at their proper distance; a ship is said to be *on her beam ends* when lying over on her side. (4) In a plow, the beam is the main piece to which the plow tails are fixed, and by which the plow is drawn.

Bean, the seed of a number of annual plants that vary in the form of growth from vines to short, stocky shrubs. Beans are borne in pods and are of many different sizes, shapes and colors. The *kidney* bean of Europe is the common bean of the United States, and many varieties of it are cultivated throughout the country. Beans are very nutritious and are freely used as an article of food in all countries in the temperate latitudes. They are especially valuable for military campaigns, since within a small space they contain a large amount of nutriment. Certain varieties of beans having tender, fleshy pods are grown in gardens and on truck farms for the pods, which are placed on the market as *string* beans. Other varieties, such as the *cranberry* and *lima* beans, are harvested and used before the seeds are ripe. The lima bean is grown in large quantities in California, where it is either canned or dried before marketing.

Beans flourish best in a rich soil having a good proportion of clay but not a great amount of moisture. The plants are very tender and are injured by the lightest frost; therefore the seed should not be sown until all danger from frost has passed.

Bear, a large, shaggy beast of prey closely allied to the dog in structure and having many features in common with the badgers, weasels and skunks. Bears have massive heads, extended narrow jaws and large teeth. The body appears more bulky than it really is, because of the looseness of the skin, the length of the coarse fur, the stumpy tail and the comparative shortness of the legs. The limbs are furnished with long and powerful claws for use in digging, fighting and climbing trees. The senses of hearing and smell are very well developed. Bears are clumsy in their movements; yet they can run rapidly, and most of them climb trees or scramble over rocks with remarkable speed. They usually make their home in some cave or crevice among rocks, or in hollow trees. There, in the early spring, the young ones, usually two in number, are born. Each bear family usually keeps pretty well to itself, instead of hunting in packs as the wolves do. Bears will eat nearly all kinds of food. They are fond of fruits, berries, herbs, roots, eggs, ants and honey. They capture and devour small animals in the woods and often raid human settlements in search of young pigs, calves, colts and sheep. Almost all bears eat fish and reptiles, and some species live almost entirely on fish.

POLAR BEAR

The species are not numerous and the family likeness is so marked in all that many of the members are difficult to distinguish from one another. The *polar bear* or *ice bear* of the Arctic region is decidedly different from all the others. It is exceptionally large, some specimens being nine feet or more in length. The color is a creamy white, except the claws, which are black. The head is long and pointed, the limbs slender and the feet large, and hairy on the soles. The *black bear* is the most widespread variety, being still found in all the great forest regions north of Mexico. It is not dangerous unless wounded or enraged. The *Florida* and the *Louisiana bears* closely resemble the black bear. The *barren-ground bear,* a large brownish-white species, lives on the brushy plains northwest of Hudson Bay. The *grizzly bear* of the mountains of western North America is one of the largest and most savage of the family. Though not quarrelsome, it is easily enraged, and then fights with terrific energy. It is found from the Black Hills of Dakota westward, and from Mexico to northern Alaska. The color ranges from gray to reddish-brown, those of the latter color being known as *cinnamon bears,* of the former, as *silver-tips.* Some weigh one thousand pounds. Formerly they were the enemies of the buffalo and deer, and now they prey upon cattle and horses of western ranches. Unlike other bears, they do not hibernate long, and they hunt for food by day and night. The *Kadiak bear* is so called from its home on

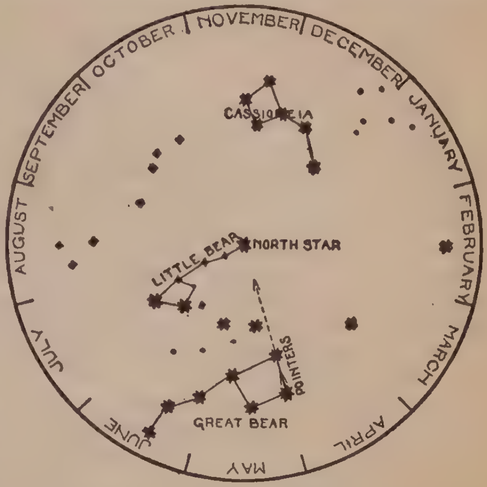
Kadiak Island, Alaska, where it was discovered in 1895. The largest known specimen of bear was a Kadiak weighing two thousand pounds, but the Kadiaks are, however, usually smaller than the grizzlies. The color varies from a yellowish to a dark brown.

Of the bears of the old world, the best known species is the *brown bear* of northern Europe and Asia. This is the bear most often seen in menageries, as it can be easily tamed and taught to dance and perform various tricks. Other Old World bears are the *Himalayan* and *Japanese black bears*, the *black sun-bear* of the Malayan Peninsula and neighboring islands, and the *sloth-bear* or *honey-bear* of India and Ceylon. The honey-bear lives mainly on fruit, insects and honey. Excepting a white nose, white circles about the eyes and a white V-shaped patch on its breast, this bear is black. The *spectacled bear* of the Andes also has white rings about the eyes.

The pelt of bears is much valued for furs, overcoats and rugs and is becoming very expensive, owing to its rarity. The flesh is used for food in some parts of the world, and the fat and claws are valuable.

GRIZZLY BEAR

Bear, Great, the group of stars called *Ursa Major* or *Great Bear* by the ancient Greeks. The seven bright stars of the constellation form a dipper-shaped figure, from which it takes, in the United States and elsewhere, the common name *Big Dipper*. The two stars which form the front of the dipper are called the pointers, because a line drawn from the bottom star through the top one will, if continued, pass so near the North or Pole Star that it is easy to locate it. In England the seven stars are called *the Wagon, Charles's Wain* or *the Plow*. The *Lesser Bear* or *Little Dipper* is the constellation in which the Pole Star is located. These two constellations, with Cassiopeia and several others, are always visible in the northern heavens, where they appear to move around the North Star. The accompanying diagram shows the relative position of the principal constellations in that vicinity. Hold it with the month at the top and it will be nearly correct at eight o'clock in the evening.



Bear and **Bull**, terms frequently used in the buying and selling of stock on the stock exchange and grain on the board of trade. Bear is the term applied to one who attempts to lower the price of the stock or grain, and bull to one who attempts to raise the price. It is evident that those who wish to buy are the bears, and those who wish to sell, the bulls. To "bear stock" or to "bull stock" are phrases in common use.

Bear′berry, an evergreen shrub of the heath family, growing on the barren moors of Scotland, northern Europe, Siberia and North America, where its berries afford food for the grouse and other wild fowl. The leaves are used in medicine as a tonic.

Beard, *beerd*, the hair upon the chin, cheeks and upper lip, which in the human family appears as a distinctive mark of the male sex. Slaves, in ancient times, were deprived of their beards, and with the Turks even now the attendants in the palace of the sultan have shaven faces. The intense love of cleanliness on the part of Egyptians would not suffer them to wear a beard, save, according to Herodotus, in times of mourning. Among the early Greeks a thick beard was considered a mark of manliness, and the Greek philosophers thought that a certain dignity of character attached to its long growth. Shaving was introduced into Greece by Alexander the Great, who ordered his soldiers to shave in order that their enemies might not seize them by the beard, and the practice continued general to the time of Justinian. During medieval and modern times the custom has changed from time to time in different countries, a clean-shaven face being sometimes the fashion, at other times a beard.

Beard, William Holbrook (1825–1900), painter, born in Painesville, Ohio. He began as a portrait painter about 1841 and settled in Buffalo, where he remained until 1857. He went to Europe and after his return devoted himself to the painting of animals, becoming popular by his humorous sketches of monkeys, rabbits, bears and other animals, which he represented as possessing human attributes. Among these are *Dance of Silenus*, *Bears on a Bender* and *Flaw in the Title*.

Bear Lake, Great, one of the large lakes of Canada, situated in the district of Mackenzie, just under the Arctic Circle. Its outline is very irregular; its greatest length is 150 miles, and it receives the drainage from a large territory. Its outlet is through Great Bear River, which leads to the Mackenzie. Bear Lake is situated on low land, scarcely 200 feet above sea level. The waters are clear and cold, and the lake abounds in fish, among which are herring and salmon.

Beatrice, *be′a tris*, Neb., the county-seat of Gage co., 40 mi. s. of Lincoln, on the Big Blue River and on the Union Pacific, the Rock Island, the Burlington and other railroads. The city has good water power and extensive manufactures, including flour and agricultural implements. The state institution for feeble minded youth is located here. The municipality owns and operates the waterworks. The place was settled in 1859 and was made a city in 1873. Population in 1910, 9356.

Beatrice Portinari, *por te nah′re*, (1266–1290), the poetical idol of Dante, the daughter of a wealthy citizen of Florence and wife of Simone dei Bardi. She was but nine years of age when Dante met her first at the house of her father. He saw her only once or twice throughout his life, and she probably knew little of him. The story of his love is recounted in the *Vita Nuova*, and she has an important place in the *Divina Commedia*.

Beaumarchais, *bo mahr shay′*, Pierre Augustin Caron de (1732–1799), a French wit and dramatist. His proficiency in music was such that he was made music-master to the daughters of Louis XIV. He first distinguished himself by his *Memoires*, or statements in connection with a lawsuit, which by their wit, satire and liveliness entertained all France. In 1775 appeared *The Barber of Seville*, and its success was immediate and great. With its sequel, the *Marriage of Figaro*, it has given Beaumarchais a permanent reputation as the most important dramatist of the eighteenth century in France. He wrote several other works, among them a melodrama and a libretto for an opera, but they added nothing to his fame. He was instrumental in securing aid for the American colonies from France, during the Revolutionary War.

Beaumont, *bo mont′*, Tex., the county-seat of Jefferson co., 80 mi. n. e. of Houston, on the Neches River and on the Texas & New Orleans, the Beaumont & Kansas City and other railroads. It is in a vast timber district and is one of the greatest lumber centers in the South. The manufactures include foundry and machine shop products, furniture, ice and tile, while live stock and hides are also exported. Oil was discovered in 1901, and since that time the city has developed rapidly. Population in 1910, 20,640.

Beaumont, *bo′mont*, Francis (1584–1616), and **Fletch′er,** John (1579–1625), two eminent English dramatic writers, contemporaries of Shakespeare, and the most famous of literary partners. In all, the works which bear their names number over fifty, and it is impossible to discover just what share each had in these productions. Certain of the plays, indeed, as *Philaster* and *Maid's Tragedy*, we know were largely Beaumont's, while *The Faithful Shepherdess* is mostly Fletcher's. Their dramas, which in their day are said to have been preferred to Shakespeare's, have little powerful character-drawing, and are greatly marred by coarseness. They are, however, extremely clever and they contain some of the most musical lyrics in the English language.

Beaumont, William (1785–1853), an American surgeon. His experiments on digestion with Saint Martin, who lived for years after receiving a gunshot wound which left an aperture of about two inches in diameter in the stomach, were of great importance to physiological science.

Beauregard, *bo′re gahrd*, Pierre Gustave Toutant (1818–1893), an American soldier. He was born in New Orleans, studied at West Point and left it as artillery lieutenant in 1838. He served in the Mexican War and on the outbreak of the Civil War joined the Confederates, giving up his position as superintendent of the military academy at West Point. He began the war by the bombardment of Fort Sumter, gained the first battle of Bull Run, lost that of Shiloh, in spite of most determined resistance, assisted in the defense of Charleston, opposed Sherman's march to Atlanta and aided Lee in the defense of Richmond. In April, 1865, he surrendered to General Sherman. After the war he served as adjutant general of Louisiana and president of the New Orleans, Jackson & Mississippi railroad.

Beauvais, *bo va'*, a town in France, capital of the department of Oise, 54 mi., by rail, n. w. of Paris. The city has fine edifices, the choir of the uncompleted cathedral being one of the finest specimens of Gothic architecture in France. There are manufactures of Gobelin tapestries, textiles and carpets. Population in 1901, 17,260.

Bea'ver, a fur-bearing animal, about two feet in length, at one time common in the northern regions of both hemispheres, but now found in considerable numbers only in the United States and Canada. It usually lives in colonies, but occurs solitary in central Europe and Asia. It has short ears, a blunt nose, small forefeet, large webbed hindfeet and a flat tail covered with scales on its upper surface. The food of the beavers consists of the bark of trees, leaves, roots and berries. Their favorite haunts are rivers and lakes which are bordered by forests. In winter they live in houses, about three feet high and seven feet across, substantially built of branches of trees and of mud, on the water's edge so that the entrance can be under water. These dwellings are called beaver lodges, and each accommodates a single family. The teeth of beavers are very strong, and they cut down quite large trees by gnawing around them. The trees are felled for food, and also that their branches may be used in building their houses. Beavers are most peculiar, in that sometimes many families work together in communities practically as one. If the stream on which they have located is not deep enough, or if the water does not cover land enough for them, the colony will unite and build an ingenious dam of wood, stones and mud across the stream. In the pond thus created, each member has its own home. The beavers hold among animals somewhat the same position the bees have among insects, in this remarkable instinct of working in common. The fur of the beaver is valuable and was at one time largely used in the manufacture of hats, but the animals have been driven so far into the wilderness and are so nearly all killed that beaver fur is now expensive and rare.

BEAVER

Beaver Dam, Wis., a city of Dodge co., 65 mi. n. w. of Milwaukee, on Beaver Lake and on the Chicago, Milwaukee & Saint Paul railroad. It is in a fertile district, has good water power and contains flour, cotton and woolen mills, malleable-iron works and other factories. It is the seat of Wayland Academy and has a public library and several parks. The place was settled in 1841. Population in 1910, 6758.

Beaver Falls, Pa., a borough in Beaver co., 31 mi. n. w. of Pittsburg, on the Beaver River, 4 mi. above its junction with the Ohio, and on railroads of the Pennsylvania and Erie systems. It is in a coal and natural gas region and has abundant water power. The principal manufactures are iron and steel products, tubing, glassware and pottery. It contains fine public buildings and a park called Riverview. Beaver Falls was originally called Brighton. Population in 1910, 12,191.

Bechuana, *be chwah′nah,* a race inhabiting the central region of South Africa north of Cape Colony. They belong to the Bantu family and are divided into tribal sections or sub-kingdoms. They live chiefly by husbandry and cattle-rearing and work with some skill in iron, copper, ivory and skins. The impositions of the Boers and others led them to seek British protection. From 1878 to 1880 South Bechuanaland was partly administered by British officers, and in 1884 and 1885 a great part of the rest of Bechuana territory was brought under British influence.

Beck′et, Thomas a (1118–1170), archbishop of Canterbury. He was educated at Oxford and Paris and studied civil law at Bologna in Italy. On his return he was made archdeacon of Canterbury and provost of Beverly. In 1155 Henry II appointed him chancellor, and preceptor to his son, Prince Henry. At this time Becket lived in an expensive manner, was a liberal entertainer and the king's prime companion. In 1162 he was consecrated archbishop, gave up his luxurious habits and became a zealous champion of the Church, liberal only in charities. A series of bitter conflicts with the king followed, ending in Becket's flight to France. A reconciliation took place in 1170, and Becket returned to England, resumed his office and renewed his defiance of the royal authority. A rash hint from the king induced four barons to go to Canterbury and murder the archbishop while at vespers in the cathedral, Dec. 29, 1170. He was canonized in 1172, and the splendid shrine erected at Canterbury for his remains was a favorite place of pilgrimage. Chaucer's *Canterbury Tales* are told by a party of men going on a pilgrimage to this shrine.

Bed, an article of furniture upon which to sleep. Savages sleep on the ground or on beds made of leaves or the skins of animals. The Hindus use a light mattress for a bed. The Japanese lie on matting and use a wooden head rest which closely fits the neck, and the Chinese make their beds by spreading rugs or matting on the floor or ground. The beds used in Europe and America are raised on a bedstead. That used in the United States is patterned after the bed used in England and contains a mattress, pillows, sheets and quilts or comforters. The best beds have steel springs, upon which the mattress is laid.

Bed, in geology, a stratum or layer of rock of varying thickness. It may consist of a number of thin layers or *laminae,* of a single stratum having considerable thickness or of several strata taken together. The last is usually termed a *formation.* A very thin bed is called a seam.

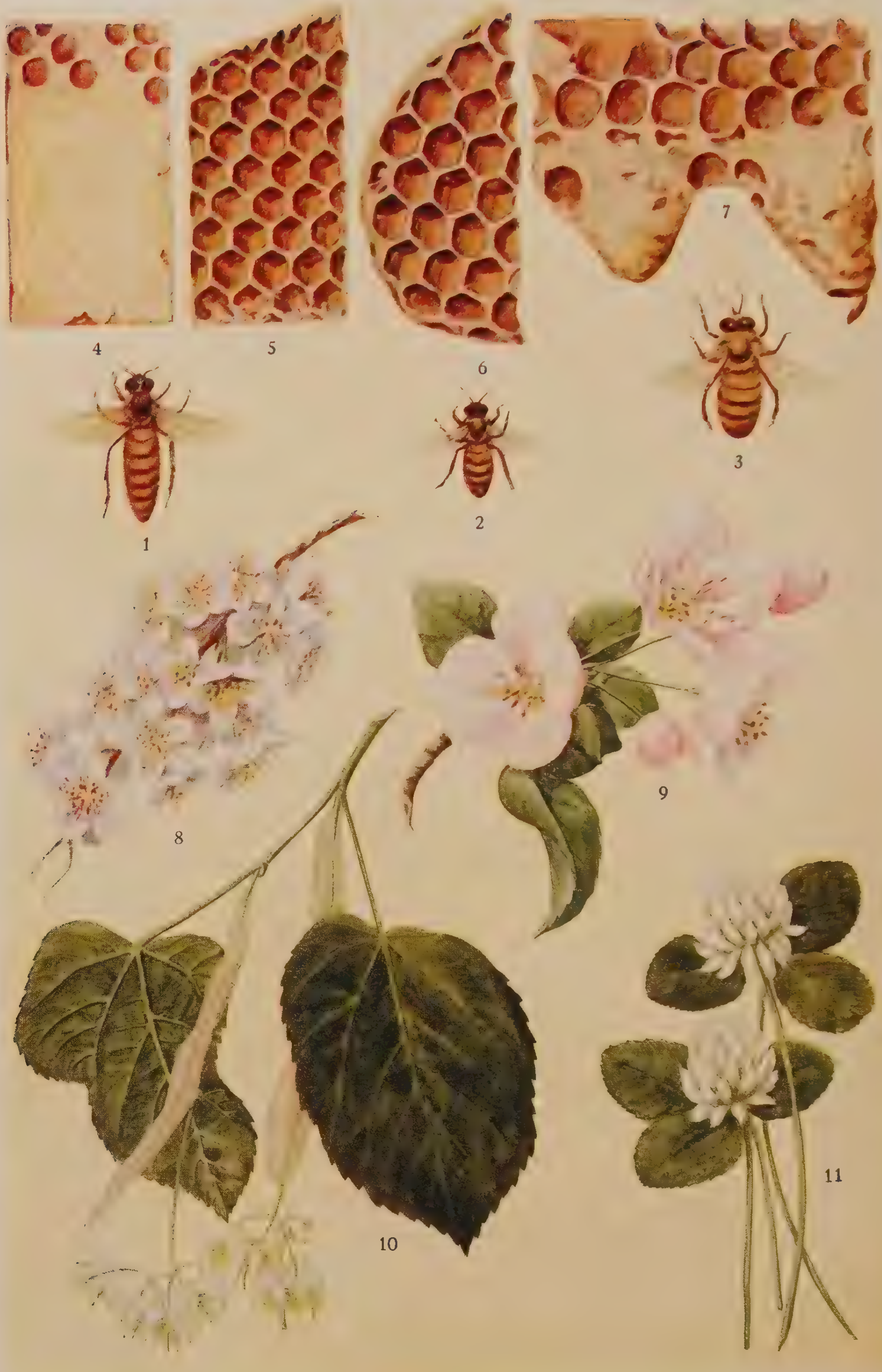
Bed′bug, an offensive insect about three-sixteenths of an inch long, with a roundish, flat body and rusty color. When touched it emits an unpleasant odor. The female lays her eggs in summer in the crevices of bedsteads, furniture and the walls of a room. The larvae are small, white and semi-transparent, and grow to full size in about eleven weeks. The bedbug is fond of human blood, but thrives on other substances.

Bede, *beed,* or **Baeda,** *be′da,* (about 672–735), known as *The Venerable,* a distinguished English scholar. He was educated at Saint Peter's monastery, Wearmouth; took deacon's orders in his nineteenth year at Saint Paul's monastery, Jarrow, and was ordained priest at thirty. He was the most learned Englishman of his day, and in a sense was the father of English history, his most important work being his *Ecclesiastical History of England.*

Bed′ford, England, the county town of Bedfordshire, on the Oise, 45 mi. n. w. of London. The chief buildings are the law courts, a range of public schools, a large infirmary, a county jail and several churches. Extensive manufactures of agricultural implements and lace bring a good trade. John Bunyan was born at Elstow, a village near the town, and it was at Bedford that he lived, preached and was imprisoned. A fine monument has been erected to him in the town. Population in 1901, 35,144.

Bedford, Ind., the county-seat of Lawrence co., 65 mi. s. w. of Indianapolis, on the Baltimore & Ohio and other railroads. It is noted for its extensive quarries of building stone. There are also railroad shops and veneering mills. Many of the buildings, both public and private, are fine stone structures. Population in 1910, 8716.

Bedford, John Plantagenet, Duke of (1396–1435), one of the younger sons of Henry IV, king of England. He defeated the French fleet in 1416, commanded an expedition to



HONEYBEE

1, Italian Queen Bee.
2, Italian Worker.
3, Italian Drone.
4, Sealed Honeycomb.
5, Worker Cells.
6, Drone Cells.
7, Two Queen Cells.
8, Wild Plum.
9, Wild Crab Apple.
10, Basswood.
11, White Clover.

Scotland in 1417 and was lieutenant of England during the absence of Henry V in France. On the death of Henry V he became regent of France, and for several years his policy was as successful as it was able and vigorous. The greatest stain on his memory is his execution of Joan of Arc in 1431. He died at Rouen and was buried in the cathedral of that city.

Bed'lam, a corruption of Bethlehem, the name of a religious house in London, converted into a hospital for lunatics. The original Bedlam stood in Bishopsgate street, while its modern successor is in Saint George's Fields. The lunatics were at one time treated as little better than wild beasts, and hence Bedlam came to be typical of any scene of wild confusion.

Bed'loe's Island or **Liberty Island,** an island in upper New York Bay, 1½ mi. s. w. of the southern extremity of Manhattan Island. It was given to the United States government for the purpose of harbor defense. This island was once occupied by Fort Wood, and on it now stands the famous colossal Statue of Liberty, given by France to the United States.

Bedouins, *bed'oo inz,* a Mohammedan people of Arab race, inhabiting chiefly the deserts of Arabia, Syria, Egypt and North Africa. They lead a wandering existence in tents, huts, caverns and ruins, associating in families under sheiks, or in tribes under emirs. They are only shepherds, herdsmen and horse-breeders, varying the monotony of pastoral life by raiding on one another and by plundering unprotected travelers, whom they consider trespassers. They are ignorant of writing and books, their knowledge being purely traditional and mainly genealogical. In stature they are undersized, and though active, they are not strong. The ordinary dress of the men is a long shirt, girt at the loins, a black or red and yellow turban for the head, and sandals. The women wear loose drawers, a long shirt and a large dark-blue shawl covering the head and figure.

Bee, a common insect of which the honey-bee and bumblebee are the best known species. There are probably not less than 5000 species scattered over all parts of the world, but they are especially numerous in the tropics. Bees naturally divide themselves into two classes; solitary bees, which live in pairs, and those which live in colonies or societies. The carpenter-bee and mason-bee are good representatives of the first class. See Carpenter-Bee.

The Honeybee. The honeybee has always been regarded as the most intelligent of insects, and it has been partially domesticated from the earliest times. Honeybees live in large colonies or societies, numbering from 10,000 to 60,000 individuals. In bee culture such a colony is known as a *swarm.* In every swarm there are three kinds of bees: the *queen,* which is the female bee that lays the eggs from which the colony is born; the males or *drones,* so called because of the low humming sound which they make, and the *workers,* which are by far the largest number. There is only one queen to a swarm, and the males may number several hundred, but at a certain season every year most of these are stung to death by the workers, who with the queen are provided with stings. It is upon the workers that the real strength of the swarm depends. They are the smallest, strongest and most active of the three classes. The queen during the season may lay as many as 300 eggs in a single day, but in cold weather the number is much less. The eggs first laid give birth to workers, and the later ones, to drones. The eggs are deposited in cells prepared by the workers, one to each cell. One set of cells is constructed for workers and another for drones, and the queen never makes a mistake in depositing the eggs. The eggs which are to develop into queens are laid in cells much larger than the others, but they will not differ from those laid in the other cells, and the queen is developed by feeding the larva on a special food.

LEAF-CUTTING BEE

The eggs are about one-twelfth of an inch long, of a bluish color and oblong in shape. They hatch in about three days. The larvae are fed by the workers for about five days, the food consisting of honey and pollen, called *beebread.* When the larva has grown so as to fill the cell, the workers seal it up and leave it for about two weeks, when the bee comes forth in the adult state. As the swarm becomes too large for the home in which it lives, a new queen is allowed to appear, and in a short time after this, on a bright, warm day, the old queen leaves the hive with a large portion of the swarm and seeks a new home for herself or enters one that the bees have found beforehand. In one season as many as three successive swarms may leave the same colony. During the winter the bees remain asleep, move about but little and eat little food.

Bees obtain their food by entering flowers and sucking up and swallowing the nectar, which is stored in the stomach-like honeybag. The hind legs are also provided with little cavities, called baskets, in which the bees store pollen for transit to the home. The bee, after gathering what pollen and honey it can carry, rises into the air, flies in a circle for a few times around, then, having found its bearings, flies home in a perfectly straight line; hence the expression *bee line*. Bee hunters take advantage of this habit to locate swarms and stores of honey. They capture the bees, feed them on sugar and water and then watch the direction of their flight.

Bees are liable to be destroyed by the larvae of a moth which enters the hives at night and lays its eggs. The larvae burrow out through the cells and sometimes kill an entire swarm. Occasionally in winter mice find their way into the hives and feed upon the bees and honey. Lice and several species of flies and birds also destroy bees.

Bee keeping is an important industry in many parts of the United States. The bees are kept in well protected hives fitted with removable frames in which the bees may build their comb and store their honey, and so constructed that the bees will be protected from the cold during the winter, and at the same time receive sufficient ventilation. The industry is also made more profitable if sweet clover, buckwheat and other plants from which desirable honey can be obtained are raised in considerable quantities in the vicinity of the place where the apiary is located. When the comb is filled with honey and sealed, the frames are taken out and the honey is extracted. The empty comb is then returned to the hive to be again filled. The usual method of extracting is to shave off the cap of the cells with a knife and set the frame in a machine that revolves rapidly. This throws out the honey and leaves the comb unbroken. Some of the best grades of honey, however, are sold in the comb, in which case they command a higher price.

On entering and leaving the flowers, bees get dusted with pollen, and as it is their habit to work but one species of flower at a time, they are important agents in the cross-fertilization of flowers; in fact, such plants as clover cannot be successfully grown without the aid of bees. See APIARY; HONEY.

Beech, the common name of trees well known in various parts of the world, including America, New Zealand and Terra del Fuego. The wood is hard and brittle, and if exposed to the air it is liable soon to decay. It is, however, peculiarly useful to cabinetmakers and turners, carpenters' planes, furniture, sabots and other small articles being made of it. As it lasts well under water piles are often made from it. The fruits, small three-sided nuts, when dried and powdered, may be made into a wholesome bread; they have also occasionally been roasted and used as a substitute for coffee. They yield a sweet and palatable oil, used by the lower classes of Silesia instead of butter, but they are, however, chiefly used as food for swine, poultry and other animals. The leaves of the beech tree, collected in the autumn, before they have been injured by the frosts, are in some places used to stuff mattresses. The North American white beech is a handsome tree, identical with the European species.

Beech'er, HENRY WARD (1813–1887), an American preacher, third son of Lyman Beecher, born in Litchfield, Conn. As a child he was diffident and sensitive, loved the ocean and was only prevented from going to sea by his admission to the church in 1826. When but eleven years old he defeated an opponent in a debate on Paine's *Age of Reason*. He showed marked talent as a debater in Amherst College, where he graduated in 1834. He studied theology under his father's instruction in Lane Seminary, for a time was pastor of a Presbyterian church in Lawrenceburg, Ind. (1837–39), and at the same time was connected with an anti-slavery paper in Cincinnati. From 1839 to 1847 he preached in Indianapolis, contributing articles to an agricultural paper. In 1847 he took charge of Plymouth Church, Brooklyn, where his congregation, noted for generosity and intelligence, heartily sympathized with him in his efforts for reform, especially in his work for abolition of slavery and for temperance.

Mr. Beecher's opinion on all public questions was eagerly sought. He was original in treatment and choice of subjects for his sermons, and his delivery was eloquent, dramatic, pathetic and witty. In power of physical endurance he was a marvel. Tender-hearted and charitable himself, any form of injustice called from him bitter denunciations. As an after-dinner speaker he was without a peer, and his popularity as a lecturer was almost unprecedented. Among his famous orations was one on Robert Burns; another was on Fort Sumter. He was a Republican and aided the cause of the party by pen and speech. He took part in the canvass of 1856, speaking at many meetings through the country. Through his influence and addresses, opinion in England concerning the Civil War was materially modified. His last public address was in Chickering Hall, New York, Feb. 25, 1887, in favor of high license. After he came to Brooklyn he contributed his *Star Papers* to the *Independent*, of which he became editor in 1861. He edited the *Christian Union* and was a frequent contributor to the *Ledger*. In *Plymouth Pulpit* are preserved the sermons preached from 1859 till his death. Among his many published works are a novel entitled *Norwood; Lectures to Young Men* and *A Circuit of the Continent*. He married, in 1837, Eunice White Bullard, author of *From Dawn to Daylight*.

HENRY WARD BEECHER

Beecher, Lyman (1775–1863), an American clergyman, born in New Haven, Conn. He graduated at Yale in 1797 and in the following year was licensed to preach and accepted the pastorate of the Presbyterian church in East Hampton, L. I. A sermon on dueling, suggested by the duel between Alexander Hamilton and Aaron Burr, made a great impression, and he soon became one of the best known preachers of New England. He was pastor of the Congregational church in Litchfield, Conn. (1810–1826), and of the Hanover Street church, Boston (1826–1832). From 1832 till 1851 he was president of the Lane Theological Seminary, Cincinnati, in which he was professor of theology, and from 1832 to 1842 was pastor of the Second Presbyterian church of Cincinnati. In 1835 Mr. Beecher was arraigned and tried for heresy by his presbytery, was acquitted by the general assembly and on the division of the Presbyterian church into two factions, he joined the new school. He returned to Boston and spent his time in publishing and revising his works. During his last ten years he lived in Brooklyn with his son, Henry Ward Beecher. He was married three times, and his five sons, William Henry, Edward George, Henry Ward, Charles and Thomas Kinnicut became clergymen.

Bee′-eater, a beautiful bird of southern Europe that winters in Africa. It is said to live almost entirely upon bees and wasps and consequently is an enemy of bee raisers. The bird has a chestnut back and crown, yellowish sides, white and black head, yellow throat and a greenish tint in the rest of its plumage. The bee-eaters nest in colonies, depositing their eggs at the end of a tunnel sometimes eight or nine feet long. The name bee-eater is sometimes given in America to the kingbird.

Beef, the flesh of the ox or cow. It is one of the most nutritious and wholesome of meats and is extensively used in all civilized countries. Shorthorns and Galloways are the best breeds of cattle for producing beef (See Cattle). Most of the beef placed on the market in the United States comes from the great meat-packing establishments, where the animals are slaughtered. When dressed the carcass is divided along the line of the back into halves. These are usually divided to form quarters, in which form most of the beef reaches the wholesale and retail dealers. By them it is cut to suit their customers. Porterhouse, sirloin, prime, rib and round are the most valuable cuts. Only beef of the best quality is placed on the market as fresh meat. The inferior grades and the least valuable cuts from the best grades are made into canned meats or corned beef. Dried beef is from the best cuts and is made by first placing the fresh beef in a pickle, then smoking it and hanging it up to dry. Canned beef is cooked and then pressed into tin cans, which are soldered to make them air-tight. This beef can be shipped to any part of the world without injury. The United States produces a larger amount of beef than any other country in the world. See MEAT PACKING.

Beef, EXTRACT OF, a fluid preparation of beef made by extracting the juice from the meat, then evaporating the water from the extract. The process is carried on in large kettles with dome-shaped covers. About two thousand pounds of meat are placed in a kettle, the lower half of which has an outer jacket. The space between this and the kettle proper is filled with water, which is heated to a high temperature. The heat extracts the juice from the meat. This is then drawn off and boiled for some time to expel the water. The extract is then run through a mill to mix it thoroughly and give it a uniform thickness. It is then put up in small jars and is ready for the market. One pound of extract contains the nutriment of forty-five pounds of beef. Beef extract is used for making broth, beef tea and some kinds of soup.

Beef'eaters, a nickname given to the guard of the sovereign of Great Britain, stationed by the sideboard at great royal dinners, and dressed after the fashion of the time of Henry VII.

Beelzebub, *be el'ze bub,* (the god of flies), the supreme god of the Syro-Phoenician peoples, in whose honor the Philistines had a temple at Ekron. The origin of this worship is probably to be sought in the scourge of flies to which the hot plain of Philistia has always been subject. In the New Testament he is the chief of demons (*Matt.* x, 25).

Beer, in general, the name of any malt liquor, but as used in the United States and on the continent of Europe, lager beer. In England beer usually means ale. Lager beer takes its name from the German *lager,* meaning storehouse, because it is kept in a storehouse for several months, to cure. Beer is usually made from barley malt and contains a small quantity of alcohol, from three to five parts in a hundred. For the process of manufacture, see BREWING.

Porter is a dark-colored beer made by adding brown malt to pale malt. It is stronger than ordinary beer and is quite generally used in England. *Stout* is a strong porter. See ALE.

Beersheba, *be er'she ba* (the well of the oath), the place where Abraham made a covenant with Abimelech, usually recognized as the southernmost limit of Palestine. It is now a mere heap of ruins near two large and five smaller wells, though it was a place of some importance down to the period of the Crusades.

Bees'wax, a wax secreted by bees and obtained from the honeycomb. The process by which it is made is not well understood. It is obtained by boiling the comb, when the wax melts and rises to the surface of the vessel and can be dipped off. On cooling, it solidifies. As thus obtained, beeswax is of a dark yellow or brownish color and contains numerous impurities. These can be removed by remelting and filtering. By cutting the wax into thin sheets and exposing it to the air and sun for some days it is bleached so that it becomes a pure white. Most of the beeswax placed upon the market is bleached. It is used in small quantities by seamstresses, also in the manufacture of candles, the preparation of ointments and cements and as a vehicle for colors. See BEE; WAX.

Beet, a plant cultivated for its root, which is large and juicy and varies in color from white to a deep red or almost black. There are many varieties, each with some special merit. Beet roots are cooked and used as a table vegetable and for pickles, and the young leaves are used as *greens.* In some localities, beets are a valued food for cattle. The most important use of beets, however, is in the manufacture of sugar, about three-fifths of all the sugar produced in the world coming from this source. Germany, Austria, Russia and France are the leading countries in the beet sugar industry, but the cultivation of the sugar beet is rapidly spreading in the United States. This beet closely resembles the varieties ordinarily raised in gardens, and thrives best in a cool temperate climate, having a reasonable supply of moisture. It has been successfully raised by irrigation in California and Utah, but Michigan and Colorado are the leading states in its production. There are now over forty beet sugar factories in the United States and the annual production of sugar is about 450,000 long tons of 2240 pounds each. See SUGAR, subhead *Beet Sugar.*

Beethoven, *ba'to ven,* LUDWIG VON (1770–1827), a great German musical composer, born at Bonn. He studied under his father, a tenor singer, and at intervals under more noted teachers. He began to publish in 1783, became assistant court organist in 1785, and in 1792, was sent by the elector of Cologne to Vienna where he was the pupil of Haydn. There, in spite of many discouragements, he acquired a high reputation for pianoforte extemporization, though the merit of his written compositions was not recognized. In or near Vienna almost all his subsequent life was spent, his artistic tour in North Germany in 1796 being the most important break. His later life was rendered somewhat morbid by his deafness, of which the first signs appeared in 1797. However, his best works were published after 1800, two periods being observable: the first from 1800 to 1814, comprising *Symphonies* 2 to 8, the opera *Fidelio* (originally *Leonore*), the music to Goethe's *Egmont* and his most notable overtures; the second, comprising the *Ninth Symphony* and the more important of his sonatas, notably the *Moonlight* and *Kreutzer* sonatas.

LUDWIG VON BEETHOVEN

Beethoven's name is inseparably connected with the symphony, for it was he who brought the form almost to perfection. His *Fifth* and *Ninth* symphonies are among the most beautiful compositions extant.

Bee'tle, the common name of the Coleoptera, the largest order of insects, of which there are known to be at least 150,000 species. They have four wings but the outer pair are hard and useless for flying. They are useful, however, as a double piece of armor to cover the soft back of the insect. In some species these wing covers are beautifully colored and brilliantly marked in varied designs. There are minute, almost microscopic forms of beetles, and large ones which may reach four inches in length. There is no uniformity in shape, as some are almost globular, others flat and round; some are long and slender, others thick and broad. The mouths of beetles are fitted for biting and tearing, and in some species the mandibles or jaws are very large and strong. In some, the head is extended in a long beak not a part of the mouth. Beetles are found in the water, on the land, in flowers, in the ground, in the homes of other insects and even living as parasites in other animals. No parts of the world are free from them. Even the waters of hot springs and the ocean make homes for them. Their range of food is as wide as their habitations. Many species capture their food alive, while others prefer dead and decaying tissues. They have powerful compound eyes and sensitive antennae, which vary wonderfully in size and shape. Some are saw-like, others feathery, others long and smooth, some bearing leaf-shaped attachments, others terminating in knobs or catkin-like enlargements. Some beetles protect themselves by their mandibles, others by imitating their surroundings very closely, while some feign death and drop to the ground when disturbed. Some inoffensive species imitate wasps and hornets in their actions and so escape attack, while still other species protect themselves by shooting offensive odors at a pursuer. Their usefulness in fertilizing flowers and in burying decaying substances, and, in some instances, in serving as food and medicine, cannot be denied; yet in general they are very destructive and some are terrible pests. They pass through a regular metamorphosis, and their larvae, which are usually rather thick and clumsy in shape, move about and are armed with strong mandibles, which they use viciously. The larvae are commonly known as grubs. Their pupa state, which they pass in rude cocoons or cases, sometimes lasts for several years. Very handsome collections of beetles can be easily made, because their hard wing-cases preserve their shapes, and no species is poisonous to handle.

Bego'nia, alarge genus of juicy-stemmed herbs with fleshy, one-sided leaves of various colors, and sometimes showy flowers, usually pink or red, and often variegated. Different species readily mix and many varieties have been raised from the tuberous-rooted kinds. From the shape of their leaves they have been called *elephant's ear.* (See illustration on next page.)

Be'hemoth, the animal described in the Bible, *Job* XL. The description is most applicable to the hippopotamus. The word seems to be of Egyptian origin and to signifiy "water ox," but it has been variously asserted to be the ox, the elephant, the crocodile and various other animals.

Behistun, *ba his toon'*, or **Bisutun**, a mountain near a village of the same name in Persian Kurdistan, celebrated for the sculptures and cuneiform inscriptions cut upon one side of a rock rising almost perpendicularly to the height of 1700 feet. These works, first copied and deciphered by Rawlinson, stand about 300 feet from the ground, were executed by the orders of Darius I, king of Persia, and set forth his genealogy and victories. They are written in Persian, Median and Assyrian. To receive the inscriptions, the rock was carefully polished and coated with a hard, siliceous varnish.

BEGONIA

Behring, *ba'ring*, Emil Adolf (1854–), a noted German physician, born in Prussia. After graduation from the University of Berlin he was appointed surgeon in the army. His subsequent positions were professor in the University of Halle and director of the Hygienic Institute at Marburg. Behring was the discoverer of the diphtheria serum, one of the most important steps in modern medical progress. One of his important works is *Resistance to Infectious Diseases.*

Behring, Vitus. See Bering, Vitus.

Behring Sea. See Bering Sea.

Beirut or **Beyrout**, *ba'root* or *ba root'*, the chief seaport of Syria, capital of a province of the same name, 60 mi. n. w. of Damascus. Its chief exports are olive oil, cereals, sesame, tobacco and wood; its manufactures are silk and cotton. In ancient times Beirut was a large and important Phoenician city. The Byzantine emperor Theodosius II raised it to the rank of a city, and it again rose to importance during the Crusades. It was bombarded and taken by the British in 1840. Population, estimated between 120,000 and 140,000.

Bejapoor, *be ja por'*, a ruined city of Hindustan, in the Bombay presidency, on an affluent of the Kistna, 245 mi. s. e. of Bombay It was one of the largest cities in India until its capture by Aurungzebe in 1686. The ruins, of which some are in the richest style of Oriental art, are chiefly Mohammedan, the principal being Mahomet Shah's tomb, with a dome visible for 14 miles, and a Hindu temple in the earliest Brahmanical style. Population, about 17,000.

Bel. See Baal.

Belas'co, David (1862–), an American playwright, born in San Francisco. He went upon the stage at the age of twelve and soon showed remarkable ability in adapting plays and stories to his use. He was connected with the Madison Square theater of New York City, later with the Lyceum theater, and during that time devoted himself chiefly to the writing of plays, among them being *Lord Chumley*, produced for E. H. Sothern, *The Girl I Left Behind Me* (1893), *The Heart of Maryland*, a stirring melodrama of the Civil War, *Zaza*, *Men and Women*, *Du Barry*, *Sweet Kitty Bellairs*, *The Darling of the Gods* and *Adrea.* He has also been manager of some of the greatest of American actors, notably Mrs. Leslie Carter and David Warfield.

Belem, *ba laN'*. See Para.

Belfast', a seaport of Ireland, principal town of Ulster and county town of Antrim. It is the second city of Ireland in population and the first in manufactures and trade. The chief educational institutions are the Queen's College and the theological colleges of the Presbyterians and Methodists. The harbor and dock accommodation is now extensive, new docks having recently been added. Belfast is the center of the Irish linen trade and has the majority of spinning mills and power-loom factories in Ireland. The iron ship-building trade is also of importance, and there are breweries, distilleries, flour mills, oil mills, foundries, print works, tan yards, chemical works and rope works. The commerce is extensive. Belfast is comparatively a modern town, its prosperity dating from the introduction of the cotton trade in 1777. Population in 1901, 348,965.

Bel'fast, Me., a city in Waldo co., on Penobscot Bay, 30 mi. s. w. of Bangor, at the terminus of the Maine Central railroad. The principal industries are the manufacture of shoes, doors, sashes, leather and boards, and ship-building. The surrounding country is agricultural and there are in the neighborhood granite quarries. Belfast was settled by the Scotch-Irish in 1770 and became a city in 1853. Population in 1900, 4615.

Belgium, *bel'je um,* one of the smallest countries of Europe, is situated between 49° 30′ and 51° 30′ north latitude and 2° 33′ and 6° 6′ east longitude. It is bounded on the n. by the Netherlands, on the e. by Prussia and Luxemburg, on the s. by France and on the n. e. by the North Sea. Its greatest length is 165 miles, its greatest breadth 120 miles, and its area is 11,400 square miles, or a little less than that of Maryland.

Surface and Drainage. The surface resembles an inclined plane. The highest lands are in the southeast, and from these the country slopes gradually to the north and northwest, where it becomes a low, flat plain. The southern and eastern portions are broken and hilly. Extending through the central part of the country from north to south is a low swell which divides the basin of the Meuse from that of the Scheldt. North and west of this the land is low and level, and along the coast a sandy beach meets a shallow sea. This portion of the country is generally unattractive, but the southern and eastern portions are noted for the beauty of their scenery.

Belgium is watered by the Meuse, flowing across the eastern, and the Scheldt, flowing across the western, part. Each of these rivers has numerous tributaries extending into all parts of the country.

Mineral Resources. The southern and eastern provinces are rich in minerals, the most important being coal and iron. Lead, manganese and zinc are mined to some extent, and quarries of limestone, slate and marble are worked. The coal fields have an area of about 500 square miles, and the annual output is about 22,000,000 tons.

Agriculture. With the exception of the sandy plains in the north and some of the rocky regions among the mountains, the soil is fertile and well suited to agriculture. All tillable portions are occupied. The land is divided into small farms ranging from one and one-half to twelve and fourteen acres in size, and is cultivated with painstaking care. The low country in the north is generally devoted to raising live stock and to dairying. The hill farms in the southeast also raise live stock, principally horses, and in other localities large numbers of hogs are raised. The most important crops are flax, rye, oats, wheat, sugar beets, hops and tobacco. The interests of the farmers are carefully guarded by a government board of agriculture in each province. About one-seventh of the area of the country is covered with forests, but these are unevenly distributed, most of them being found in the hilly provinces of the southeast. Oak is the prevailing wood and furnishes considerable valuable timber. Agriculture and forestry occupy the attention of about one-half of the people.

Manufactures. Manufacturing is the most important industry, and the products are numerous and varied. Much of the work is done in small shops, in which the proprietor works alone or with one or two workmen, though large factories are numerous. The location of some of the chief industries is determined by the natural resources. The large iron works are in the southern and eastern provinces, near the coal and iron ore. They manufacture cast iron and steel and machinery of all kinds. Firearms, nails, shot, tinware and zinc are also important articles of manufacture. Flanders is the center of the flax industry, and this province has for centuries been noted for the superior quality of its linens. Liège, Verviers, Bruges and a number of other towns are noted for their manufactures of cotton and woolen goods. Lace is one of the most widely known of Belgian manufactures. Much of this is made by hand and cannot be duplicated in any other country. The industry is distributed through nearly all the provinces. Belgium is also one of the leading glass manufacturing countries of the world, and porcelain and other varieties of pottery ware of high grade are also made in some provinces. Brussels and Ghent are the centers of an important jewelry manufacture; in the agricultural district large quantities of sugar are made, and breweries and distilleries are numerous.

Transportation. The Meuse and the Scheldt are navigable, and many of their tributaries have been canalized. Besides these, there are numerous canals, so that the country has a complete system of inland waterways, extending to all the important towns. The railway system is very complete and is nearly all under government control. Most of the seagoing trade is carried on through Ostend and Antwerp.

The imports consist chiefly of food products and raw materials, such as cereals, cotton, flax, wool, lumber, minerals, chemicals and drugs; while the exports include cotton and woolen goods, laces, machinery and other manufactured products. France, Germany, the United Kingdom, the United States, Argentina and Russia are the leading countries connected with the foreign trade.

Inhabitants and Language. The inhabitants include two distinct types: a dark race which came from the south and is undoubtedly descended from the ancient Belgae; and the descendants of the Celts and Germans who entered the country from the north, and among whom the German language prevails. In the south both Flemish and French are spoken. For this reason nearly all places in the country have two geographical names, one Flemish and the other French.

Education. A system of elementary schools is maintained either by the state or the local government. The smallest unit for the maintenance of such a school is the commune. In addition to these, schools similar to our high schools are maintained by the government. Important state universities are located at Ghent, Liège and Brussels, and each of these contains schools of engineering and manufactures, arts and mechanics. There are also other industrial schools and normal schools. The Roman Catholic Church maintains a large number of parochial schools, which are estimated to equal the number of public elementary schools.

Government and Religion. The government is a constitutional monarchy, and the crown is hereditary in the direct male line of descent. The king is assisted by the ministers, who are heads of the eight departments of state. The legislative power is vested in a national parliament, known as the Chambers, and consisting of a Senate and Chamber of Deputies. The Senate is composed of 102 members, 76 of whom are elected by citizens, and the remainder by provincial councils. The members of the Chamber of Deputies are elected by direct vote of the people. For the purpose of local government, the country is divided into nine provinces, each under a governor appointed by the king. Each province has its council, which is chosen by a direct vote for a period of eight years. These provinces are divided into *arrondissements*, which are again subdivided into judicial arrondissements and cantons.

There is no state church; all religions are tolerated and the state contributes to the support of the clergy of all denominations; but Roman Catholicism is the prevailing belief and is embraced by about nine-tenths of the people.

Cities. The important cities are Brussels, the capital, Antwerp, the principal seaport, Ostend, Ghent, Liège and Bruges, each of which is described under its title.

History. Belgium takes its name from the country inhabited by the ancient Belgae, which extended from the mouth of the Scheldt as far north as the Seine, and from the sea to the Vosges Mountains. From the time of the Roman occupation till early in the sixteenth century this portion of Europe was claimed first by one power and then by another. During the reign of Charles V it became a part of the kingdom of Spain. In the religious war waged by Philip II, the northern part of the country, or the Netherlands, secured its independence, but Belgium was left subject to Philip. By the Treaty of Utrecht, which closed the War of Spanish Succession, Belgium was given to Austria, but it was seized by France in 1744, only to be restored to Austria by the Treaty of Aix la Chapelle. During the career of Napoleon, Belgium was closely united with France, and at the Congress of Vienna in 1815 it was united with the Netherlands under one government, but fifteen years later Belgium revolted and established the government which it now has. Under its present constitution the country has been placed in a prosperous condition. It is densely populated. Leopold II, the king, soon after the beginning of his reign, entered upon a policy of expansion, the result of which placed him at the head of the International African Association and made him ruler of the Kongo Free State (See Kongo Free State). Population in 1900, 6,815,054. Consult Heidenstam's *Belgian Life in Town and Country*.

Bel'grade or **Bel'grad**, capital of Servia, on the right bank of the Danube, at the confluence of the Save. The principal buildings of the town are the king's palace, the Metropolitan cathedral and the National theater. Belgrade is the seat of the Royal Servian Academy of Sciences, to which belongs the National library, with about 100,000 books. The manufactures are carpets, silk stuffs, hardware, cutlery and saddlery, and the commerce is extensive. Being the key of Hungary, it was long an object of fierce contention between the Austrians and the Turks, remaining, however, for the most part in the hands of the Turks until its evacuation by them in 1867. Population in 1900, 69,097.

Belial, *be'le al* or *beel'yal,* a word which by the translators of the English Bible is often treated as a proper name, as in the expressions, *son of Belial, man of Belial.* In the Old Testament, however, it should be translated *wickedness* or *worthlessness.* To the later Jews, Belial seems to have become what Pluto was to the Greeks, the name of the ruler of the infernal regions; and in *II Corinthians* VI, 15, it seems to be used as the name of Satan, as the personification of all that is bad.

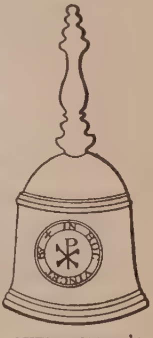
Belisa'rius, (505–565), the great general to whom the emperor Justinian chiefly owed the splendor of his reign. He obtained the chief command of an army on the Persian frontiers, and in 530 gained a victory over a superior Persian army. In 532 he checked the disorders in Constantinople and saved the life of Justinian. Successful wars were waged by him against the Vandals, the Goths and the Bulgarians, but in spite of all his services he was accused of treason and imprisoned. He was released before his death and restored to his honors.

Belize. See British Honduras.

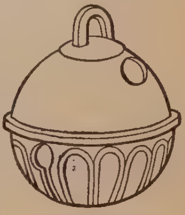
Belize, *be leez',* the capital and only trading port of British Honduras, situated at the mouth of the southern arm of the river Belize. It has no harbor, and steamers have to anchor a mile or more from the river mouth and land their cargoes by lighters. The exports are chiefly mahogany, rosewood, logwood, cedar, cocoanuts and sugar. Population, about 7000.

Belknap, *bel'nap,* William Worth (1829–1890), an American soldier and politician, born at Newburg, N. Y., and educated at Princeton. He began the practice of law in Iowa and entered the Union army as major of a volunteer regiment in 1861 and was with Sherman in his Atlanta campaign. He was secretary of war from 1869 to 1876 and was impeached in the latter year for receiving bribes, but resigned before the passage of the resolution and so defeated the proceedings, because the Senate had no longer jurisdiction.

Bell, a hollow. somewhat cup-shaped sounding instrument, made of a kind of bronze known as *bell metal* (See Bronze). Besides their use in churches, bells are employed for various purposes, the most common being to summon attendants or domestics in private houses, hotels and offices. Bells for this purpose are of small size and are either held in the hand and rung. or rung by means of an electric battery. The last method is now by far the more general.


QUEEN MARY'S HANDBELL

The Egyptians and Israelites used a rude form of bells, and it is known that bells of considerable size were in early use in China and Japan, and that the Greeks and Romans also employed them for various purposes. One form, used in ancient Egypt and Greece, was known as the *crotal.* Bells are said to have been first introduced into Christian churches about 400 A. D. in Campania. From the combination of the names *campania* and *nola,* which were old names for bells, was obtained the name *campanile,* which means bell tower. Bells were introduced into France in 550 and into England a little more than a century later. The oldest bells now existing in Great Britain and Ireland, such as the "bell of Saint Patrick's Will" and Saint Ninian's, were four-sided and made of thin iron plates hammered and riveted together.


ANCIENT CROTAL

Until the thirteenth century bells were of comparatively small size, but after the casting of the Jacqueline of Paris (6½ tons) in 1400, their weight rapidly increased. Among the more famous bells are the bell of Cologne, 11 tons 1448; of Danzig, 6 tons, 1453; of Halberstadt, 7½, 1457; of Rouen, 16, 1501; of Breslau, 11, 1507; of Lucerne, 7½, 1636; of Oxford, 7½, 1680; of Paris, 12⅘, 1680; of Bruges, 10¼, 1680; of Vienna, 17¾, 1711· of Moscow (the monarch of bells), 193, 1736; the Liberty Bell, at Philadelphia, 1752; three other bells at Moscow, ranging from 16 to 31 tons, and a fourth, of 80 tons, cast in 1819; the bell of Lincoln, Great Tom, 5½, 1834; of York Minster, Great Peter, 10¾, 1845; of Montreal, 13½, 1847, the largest bell in America; of Westminster, Big Ben, 15½, 1856; of Saint Stephen, 13½, 1858; the Great Bell of Saint Paul's, 17½, 1882. Others are the bells of Ghent, Görlitz, Saint Peter's in Rome, Antwerp, Olmutz, Brussels, Novgorod and Peking.

Bell, Alexander Graham (1847–), a noted scientist and inventor, born in Edinburgh. He received his education in Edinburgh and London and in 1870 removed to Canada. Two years later he became professor of vocal physiology at Boston University, where he introduced his father's system of teaching the dumb to speak. His fame and fortune are due to the invention of the telephone, of which he holds the patent and which he exhibited at the Centennial Exhibition of 1876. After Bell, a large number of experimenters appeared, suggesting endless modification, but no essentially new principle. The *photophone*, the joint work of Bell and Taintor, in which a vibratory beam of light is substituted for the electric current in conveying speech, was introduced in 1880. Bell was also the inventor of the graphophone, which was the forerunner of the phonograph. He never gave up his interest in the education of the deaf, upon which he wrote much.

ALEXANDER GRAHAM BELL

Bell, HENRY (1767–1830), a Scotch engineer, the first man successful in applying steam to the purposes of navigation in Europe. In 1798 he turned his attention specially to the steamboat, the practicability of steam navigation having been already demonstrated. In 1812 the *Comet*, a small thirty-ton vessel built at Glasgow under Bell's direction and driven by a three-horse-power engine made by himself, commenced to ply between Glasgow and Greenock, and this was the beginning of steam navigation in Europe. Bell is also credited with the invention of the discharging machine used by calico-printers.

Bell, JOHN (1797–1869), an American statesman, born near Nashville, Tenn. He graduated at what is now the University of Nashville in 1814, was admitted to the bar in 1816 and was elected to the state senate in 1817. He served in Congress as a Whig from 1827 to 1841, winning a reputation as a debater and especially as an ardent supporter of the protective tariff. He supported General Jackson as candidate for the presidency in 1832, and two years later was elected speaker of the House of Representatives. In 1841 Bell was appointed secretary of war by President Harrison, and he was later in the United States Senate for ten years. He opposed the Texas annexation policy, advocated Henry Clay's compromise of 1850, voted against the Kansas-Nebraska bill of 1850 and opposed the repeal of the Missouri Compromise. In 1860, when secession was threatened by the Southern states, a convention of so-called "Constitutional Union" men nominated him for president, and he received the electoral votes of Tennessee, Virginia and Kentucky. He, with other citizens of Tennessee, issued an address in favor of an armed neutrality in Tennessee in 1861, but he later supported the Southern policy.

Bellacoo'la, a tribe of indians living in British Columbia. Though once a strong and important body of indians, their number has been reduced to a few hundred by diseases which they have gained from their acquaintance with the whites. They are a detached tribe of the Salishan group of indians.

Belladon'na, the deadly nightshade, a plant native of Great Britain. All parts of the plant are poisonous, and the incautious eating of the berries has often produced death. The dried juice is commonly known by the name of extract of belladonna. It is narcotic and poisonous, but is of great value in medicine, especially in nervous ailments. It has the property of causing the pupil of the eye to dilate. The fruit of the plant is a dark, brownish-black, shining berry. The name signifies "beautiful lady" and is said to have been given because the juice was used to give a brilliant appearance to the eye.

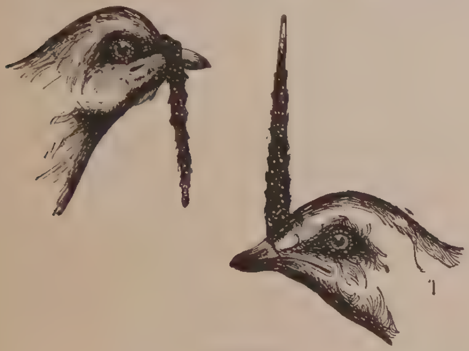
Belladonna Lily, so called on account of its beauty, a plant having delicate blushing flowers clustered at the top of a leafless flowering stem. It is a native of the Cape of Good Hope and of the West Indies.

Bellaire, *bel lair'*, O., a city in Belmont co., on the Ohio River, 5 mi. s. of Wheeling, W. Va., and on the Baltimore & Ohio, the Pennsylvania and other railroads. It is in a rich agricultural district, where coal, iron, cement, brick clays and limestone are also found in abundance.

The city has extensive manufactures of glass, steel, iron, nails and farm implements. It has water and gas works and electric lights. Population in 1910, 12,946.

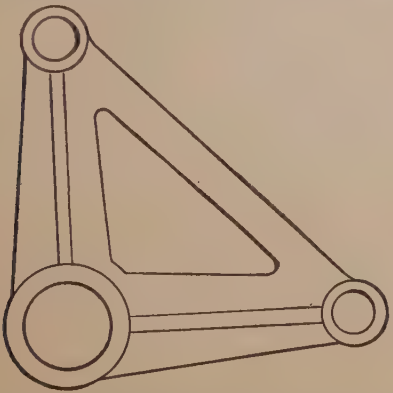
Bel′lamy, Edward (1850–1898), an American lawyer and author, born in Massachusetts. He was admitted to the bar in 1871, but subsequently entered journalism, being connected with the Springfield, Mass., and New York press. In 1888 he published *Looking Backward*, a novel in which he outlines a dream or prophecy of perfect socialism. It is by this work that he is best known.

Bell′bird, the name of a South American bird, so-called because of its peculiar notes, which sound like the tolling of a bell. From the forehead at the base of its beak grows a short cylindrical projection of black skin dotted with small bunches of feathers. When the bird utters its note this projection slowly extends to perhaps five inches in length.



BELLBIRD

Bell-crank, in machinery, a rectangular lever by which the direction of motion is changed through an angle of 90°, and by which its velocity ratio and range may be altered at pleasure by making the arms of different lengths. The bell-crank is much employed in machinery; it is so-called because it is the form of crank usually employed in changing the direction of the wires of house bells.



BELL-CRANK

Bellefontaine, *bel′fon tain,* Ohio, the county-seat of Logan co., 45 mi. n. w. of Columbus, on the Detroit & Lima Northern and the Ohio Central railroads. It occupies the highest elevation in the state and is in an agricultural region. The city has extensive railroad shops and manufactures carriage-bodies, iron bridges and other articles. The place was first settled in 1818. Population in 1910, 8238.

Belle Isle, *bel eel′,* a rocky island at the eastern entrance to the Strait of Belle Isle, the channel between Newfoundland and the coast of Labrador. Here is a lighthouse 470 feet high. Steamers from Glasgow and Liverpool to Quebec, round the north of Ireland, commonly go by this channel in summer, as it is the shortest route.

Belle Isle, Strait of, a channel between Labrador and Newfoundland, which connects the Gulf of Saint Lawrence with the Atlantic Ocean. It is the more northern of the two channels which connect these bodies of water, and is the shortest course between Great Britain and the Saint Lawrence.

Bellerophon, *be ler′o fon,* in Greek mythology, the hero who slew the Chimaera. He had been sent on this quest by the king of Lycia, who wished to be rid of him, but he was assisted by Minerva in securing Pegasus, the winged horse, and with the aid of this steed he killed the monster. Legend says that in his later years he attempted to soar on Pegasus to the abode of the gods, and that for his presumption he was dashed to the earth and killed.

Belleville, *bel′vil,* a city of Ontario, Canada, situated on Lake Ontario at the mouth of the Moira River, and on the Grand Trunk and Midland railroads, 45 mi. w. of Kingston. It is in the midst of a fertile agricultural and dairy country, and its leading industries are commerce and manufactures. The most important manufacturing establishments consist of ironworks, factories and sawmills. It has a good harbor and has steamer connection with all important ports on the lake. Albert University, which maintains separate colleges for men and women, and a large asylum for the deaf and dumb are located here. The town is also noted for its many beautiful churches. Population in 1901, 9119.

Belleville, Ill., the county-seat of Saint Clair co., 14 miles s. e. of Saint Louis, on the Illinois Central, the Louisville & Nashville and other railroads. It is also connected with Saint Louis by electric railways. It is in an agricultural and coal mining region and has machine shops, iron foundries, stove works, glass and nail manufactories and flour mills. The city has a public library, Saint Peter's Cathedral, Saint Elizabeth's Hospital and a commercial school. It was settled in 1814 and was incorporated in 1846. Population in 1910, 21,122.

Bellevue, *bel vu'*, Ky., a city in Campbell co., on the Ohio River, opposite Cincinnati, and on the Chesapeake & Ohio railroad. It was settled in 1866, incorporated in 1871 and is primarily a residence suburb of Cincinnati. Population in 1910, 6683.

Bel'lingham, Wash., the county-seat of Whatcom co., 79 mi. n. of Seattle, on Bellingham Bay, and on the Great Northern, the Northern Pacific and other railroads, making it an important railroad center. The surrounding region is fertile and also contains stone quarries and coal mines. The city has an excellent harbor and ships large quantities of fish, fruit, live stock and farm and dairy produce. The manufactures include lumber products, tin cans, boilers and engines, flour and feed, condensed milk and many other products. A state normal school is located here, and the city has churches, a public library, several hospitals, a city hall and a courthouse. The city is the commercial metropolis for the county and for a large surrounding territory, and is one of the most thriving cities in the northern part of the state. It has street railways and electric lights. The town of Whatcom was settled in 1858 on the present site of Bellingham, and the city was formed in 1903 by the union of Whatcom and Fairhaven. Population in 1910, 24,298.

Bellini, *bel le'ne*, Giovanni (about 1426–1516), the founder of the Venetian school of painting. His father, who excelled in portraits, and his older brother, Gentile, both painted with him and were worthy members of the school. Giovanni contributed much to make oil-painting popular and has left many noteworthy pictures. He was a colorist of the first order and did much to impart the marvelous golden tone to Venetian painting. Titian and Giorgione were among his pupils. Among his best known works are *Peter Martyr*, *The Crucifixion*, *The Coronation of the Virgin* and *The Transfiguration.*

Bellini, Vincenzo (1802–1835), a celebrated composer, born at Catania, Sicily. He was educated at Naples and commenced writing operas before he was twenty, composing for the principal musical patrons of Europe. His most celebrated works are *Il Pirata* (1829); *La Somnambula* (1831), *Norma* (1832), his best and most popular opera, and *I Puritani* (1834). His untimely death, at the age of thirty-three, cut short a career which promised much for musical art.

Bello'na, the goddess of war among the Romans, often confounded with Minerva. She was the sister of Mars, or, according to some, his daughter or his wife.

Bellows, *bel'lus*, a machine for producing and directing a strong current of air. The bellows is used to increase the heat of a fire by causing it to burn more rapidly. The common blacksmith bellows has three boards, the upper, lower and center. These are connected by flexible leather sides, which are air-tight. A weight is attached to the lower board. When it falls, air is drawn in through a valve. A lever is also attached to the board by which it is raised. When the lower board is raised the air in the lower chamber is forced through a valve in the center board into the upper chamber. A weight upon the upper board forces the air out through the nozzle, which is connected with the forge. Such a bellows produces a continuous current of considerable force. See Blowing Machine.

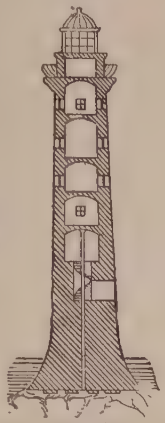
BELLOWS

Bellows Fish, also called the *trumpet-fish*, or *sea-snipe*, not uncommon in the Mediterranean and on the west coasts of Europe. It is from four to five inches long and has an oblong oval body and a tubular elongated snout, which is adapted for drawing from among seaweed and mud the minute animals on which it feeds.

Bell Rock or **Inch Cape,** a dangerous reef in the North Sea, 12 miles from Arbroath, nearly opposite the mouth of the river Tay. The lighthouse on it was erected in 1810 by Robert Stevenson, at a cost of upward of $300,000. It rises to a height of 120 feet and has a revolving light showing alternately red and white every minute, and visible for 15 miles. It also contains two bells, which are rung during thick weather. The reef is partly uncovered at ebb tides.

Bel'mont, August (1816–1890), an American financier, born in Germany. He was employed by the Rothschilds in various capacities and represented them at New York after 1837. He was Austria's consul general at New York from 1844 to 1850 and in 1854 became American minister to Holland. He took an active interest in politics, being chairman of the national Democratic committee for twelve years, and he was also a liberal patron of the fine arts.

His son, August Belmont (1853–), also became a prominent capitalist, being an officer and director in many large railway, banking and manufacturing corporations, including the consolidated traction lines of New York City. He is also a prominent Democratic politician.



BELL ROCK LIGHTHOUSE
Longitudinal section

Beloit', Wis., a city in Rock co., 85 mi. s. w. of Milwaukee, on the Rock River and on the Chicago, Milwaukee & Saint Paul and the Chicago & Northwestern railroads. The river furnishes water power and the city contains foundries, paper mills and extensive manufactories of gas engines, windmills, agricultural implements and other articles. The city is the seat of Beloit College, a small Congregational institution of high standing. Beloit was first settled in 1824. Population in 1910, 15,125.

Belshaz'zar, the last of the Babylonian kings, who reigned conjointly with his father Nabonidus. He died in 538 b. c., during the successful storming of Babylon by Cyrus. This event is recorded in the book of *Daniel.*

Belt or **belting,** a flexible endless band, or its material, used to transmit motion or power from one wheel, roller or pulley to another. Driving belts are usually made of leather, india rubber or woven material, but ropes and chains are also used for the same purpose

There are a number of ways of lacing a belt, but every machinist has his own favorite method. One rather complex but effective way is to punch twenty-four holes, thirteen on one side and eleven on the other side. The lace is doubled in the center of its length and run through the middle hole of the second row on that side of the joint which contains eleven holes. The lace is passed over and under from side to side, bringing both ends of the lace out of the middle hole, and there the ends are tied on the outside of the belt. By this means there is no crossing of the lace on either side, and there can be no side play, and the lace will not creep. When a light belt is called upon to do little work, it is customary to lace the belt shoestring fashion, back and forth through single rows of holes, always beginning the lacing in the center of the belt. Imperfectly adjusted belting is a fruitful cause of power waste, and a poorly laced joint is the principal cause of loss of transmitted energy. If a lace be crossed on the under side the belt is raised from the pulley every time the joint comes around, and not only is the power wasted, but the lace is soon worn through. Sometimes the lace on the other side is covered by a piece of belting, scraped thin and cemented to the joint In many cases the ends of the belt are scarfed, the laps cemented together and the whole strengthened by rivets.

Belt, The Great and The Little, the names of two straits of eastern Denmark, which connect the Baltic Sea with the Cattegat. The Great Belt runs between the islands of Zealand and Funen and is, on an average, about 15 miles wide, but its greatest breadth is 20 miles. The navigation of this strait is exceedingly dangerous, because of the numerous small islands and sand banks in the channel. The Little Belt runs between Funen and the coast of Jutland. In the narrowest place this strait is about a mile wide. A strong current often flows through both of these channels.

Bel'tane, a sort of festival formerly observed in Ireland and Scotland, and still kept up in some remote parts. It is celebrated in Scotland on the first day of May, usually by kindling fires on the hills and eminences. In early times it was compulsory on all to have their domestic fires extinguished before the Beltane fires were lighted, and it was customary to rekindle the former from the embers of the latter. This custom no doubt derived its origin from the worship of the sun.

Beluchistan, *be loo'che stahn'*. See Baluchistan.

Belu'ga, a kind of whale or dolphin, the white whale or white fish found in the northern seas of both hemispheres. It is from 12 to 18 feet in length, and is pursued for its oil, classed as *porpoise oil,* and for its skin. In swimming, the animal bends its tail under its body like a lobster and thrusts itself along with the rapidity of an arrow. A variety of sturgeon found in the Caspian and Black Seas is also called beluga.

Belvidere, *bel vi deer′,* Ill., the county-seat of Boone co., 78 mi. n. w. of Chicago, on the Kishwaukee River and on the Chicago & Northwestern Railroad. It is in a fertile agricultural district and has important dairying interests. There are sewing machines, bicycle and automobile works, flour mills and creameries. The place was settled in 1836 and was first incorporated in 1857. Population in 1910, 7253.

Belzo′ni, Giambattista (1778–1823), an Italian explorer and archaeologist. In 1803 he emigrated to England, and in 1815 he visited Egypt, where he made a hydraulic machine for Mehemet Ali. He then devoted himself to the exploration of the antiquities of the country. He succeeded in transporting the bust of Rameses II from Thebes to Alexandria, from whence it was taken to the British Museum; explored the great temple of Rameses II at Abu-Simbel; opened the tomb of Seti I, from which he obtained a splendid alabaster sarcophagus, and also succeeded in opening the second of the pyramids at Gizeh.

Bem′ba. See Bangweolo.

Benares, *be nahr′ez,* a town in Hindustan, on the left bank of the Ganges, 390 mi. n. w. of Calcutta. It lies along the Ganges for three miles, and the high bank has many broad flights of stairs leading to temples, mosques, palaces and other buildings. It is the headquarters of the Hindu religion and contains about 1500 temples, to one of which is attached a large number of sacred monkeys. The Hindus consider Benares to be the most sacred place in the world, and throngs of pilgrims visit it, thinking that those of their faith who die there gain immediate admission into heaven. Benares carries on a large trade in the produce of the district, and manufactures silk shawls, embroidered cloth and jewelry. Population in 1901, 203,100.

Bender or **Bendery**, *byen dyer′e,* a town and fortress of Russia, in Bessarabia, on the Dniester, 58 mi. w. n. w. of Odessa. Its commerce is important, and it carries on varied manufactures. Bender was taken by the Russians in 1770, and after repeatedly changing hands between the Russians and the Turks it was ceded to Russia in 1812 by the Peace of Bucharest. Population, 31,851.

Benedictine, *ben′e dik′tin,* a strong liquor prepared in the same way since 1510, by the Benedictine monks of the abbey of Fécamp, in Normandy, France. While it is said to have medicinal properties, it is chiefly in use as a cordial after dinners.

Benedictines, an order of monks noted for their following of the rules of Saint Benedict. The first monastery of the order was established at Monte Cassino by Saint Benedict, about 529. Benedict's idea was that each monastery should be a separate organization, and that the monastery should, for the monk, take the place of the family. The order spread very rapidly, and after the sixth century the Benedictines were the leaders in the spread of Christianity and civilization in the West. During the Dark Ages the order was very influential in preserving some of the traditions which the bishops had been instrumental in keeping alive, and their monasteries were the only places where the followers of the Church could find meeting-places in which they would be separate from the social classes. Because of the relation of the Benedictines to the Church and to the social classes, their monasteries became very large establishments, and their membership embraced not only monks but laymen. Within these establishments various industries and trades were prosecuted, and some of the brothers were noted for their skill in dyeing, weaving of cloth and tanning. It was also in these monasteries that many of the books written before the invention of the art of printing were made. The order has never lost its influence and has spread wherever the Roman Catholic Church is known. The Benedictines are noted for their piety and for their fostering of education, many of the best colleges and other institutions of learning in the Catholic Church being under their control.

Ben′efit Asso′cia′tions. See Fraternal Societies.

Ben′efit of Cler′gy, a privilege formerly recognized in England, by which the clergy accused of capital offenses were exempted from the jurisdiction of lay tribunals and were left to be dealt with by their bishop. Though originally it was intended to apply only to the clergy or clerks, later every one who could read was considered to be a clerk. A layman could only receive the benefit of clergy once, however, and he was not allowed to go without being branded on the thumb, a punishment which later was commuted to whipping, imprisonment or transportation. The benefit of clergy was abolished in 1827.

Ben′even′to (ancient Beneventum), a city of southern Italy, in a province of the same name, on a hill between the rivers Sabato and Calore. 39 mi e. n. e. of Naples. Few cities have so many remains of antiquity, the most perfect being a magnificent triumphal arch of Trajan, built in 114. The cathedral is a building of the twelfth century, in the Lombard-Saracenic style. The chief manufactures are gold- and silver-plated ware, leather and parchment, and the trade in grain is important. The town has been the seat of an archbishop since the tenth century. Population in 1901, 17,603.

Benev'olence, the name applied to certain forced loans or contributions which the kings of England sometimes demanded of their subjects when they were unable to obtain a sufficient revenue from Parliament. By the Bill of Rights in 1689 such forced loans were declared illegal.

Bengal, *ben gawl',* a lieutenant governorship of British India, situated at the head of the Bay of Bengal. Its greatest length is 475 mi., its greatest width, 350 mi., and its area, 151,543 sq mi., to which should be added the area of a number of partially independent states which include 58,500 sq. mi. Bengal is a large plain, surrounded by mountains and interested by many rivers, of which the Brahmaputra and the Ganges are the most important. The portion of the country around the Bay of Bengal is low and flat, and a large area of it is inundated during the rainy season each year. The soil is very fertile and supports a luxurious vegetation. Bengal is a rich agricultural country and about 86,000 square miles are under cultivation. Of these, three-fourths are given to rice, about one-fifth to other cereals and the remainder to oil seeds, opium, indigo and a few other minor crops. Silk is also grown, and the raising of jute is an important industry. The manufacturing interests have suffered somewhat from the introduction of machine-made goods from Great Britain and other European countries, so that the delicate cotton and silk fabrics, formerly so common in Bengal, have nearly disappeared. Modern methods of manufacture have been introduced and large factories have been erected in some of the cities and are supported by European capital. The commerce is very extensive, and most of it is carried on through the port of Calcutta. The imports are textiles, cotton, yarn, metal, sugar and machinery; and the exports, rice, opium, indigo, wheat and cotton. Most of the trade is carried on with Great Britain, China and Japan, and to some extent with the United States and Germany. The climate is very hot and during the rainy season is very unhealthful for any but the natives. The government is highly centralized. A lieutenant governor is the chief executive and is practically unassisted by any legislative body, though his authority is nominally shared by a council. Bengal is separated into nine divisions, each of which is under the administration of a board of commissioners. The different administrative bodies are all under the supervision of the high court of Calcutta. Population in 1901, 78,448,735. See INDIA.

Bengal, BAY OF, that portion of the Indian Ocean which lies between Hindustan and Farther India, or Burmah, Siam and Malacca and which may be regarded as extending south to Ceylon and Sumatra. It receives the Ganges, Brahmaputra and Irrawaddy rivers. Calcutta, Rangoon and Madras are the most important towns on or near its coasts.

Bengali, *ben gah'le,* one of the vernacular languages of India, spoken by about 50,000,000 people in Bengal. It is akin to Sanskrit, is written in characters that are evidently modified from that language, and it possesses many words borrowed from the Sanskrit. Large numbers of Bengali books and newspapers are now published.

Benguela, *ben ga'la,* a district belonging to the Portuguese, situated on the west coast of South Africa and forming one of the three provinces of Angola. It has an area of about 150,000 sq. mi. The region is well watered and produces abundant crops. The minerals include copper, silver, salt, sulphur and petroleum, but none of them is mined to any extent. In the earlier times it was a gerat market for slaves. The only town of importance is Benguela, the capital, situated on a bay of the Atlantic in a beautiful valley.

Beni, *ba'ne,* a river in Bolivia, South America It rises in the eastern slopes of the Andes and, after a course of 900 miles, joins the Mamore to form the Madeira, which flows into the Amazon near Serpo. See MADERIA RIVER.

Benin, *be neen',* a negro country of West Africa, on the Bight of Benin, extending along the coast on both sides of the Benin River, west of the Lower Niger, and for some distance inland. The country, which gradually rises as it recedes from the coast, is well wooded and watered and is rich in vegetable productions. Cotton is a native product and is woven into cloth by the women; sugar cane, rice and yams are also grown. There is considerable trade in palm-oil. In consequence of a massacre of a

British mission, the king was deposed and the country was annexed by the British in 1897.

Ben'jamin, Judah Philip (1811–1884), an American lawyer and statesman, born in the West Indies. When a young child he was taken to North Carolina; he later studied law in New Orleans and was elected United States senator for Louisiana in 1857. He was an able and earnest advocate of the Southern cause in the pre-Civil War era, and when the Confederacy was organized, he became attorney general in its cabinet, later becoming secretary of state. He proved remarkably capable, being widely known as "the brains of the Confederacy." In 1865 he went to London, where he practiced law with great success until his death.

Ben Lo'mond, a mountain in Scotland, in Stirlingshire, rising to a height of 3192 feet and giving a magnificent prospect of the vale of Stirling, the Lothians, the Clyde, Ayrshire, Isle of Man and the hills of Antrim. This mountain and the surrounding country occupy a prominent place in Scott's *Lady of the Lake*.

Ben Macdhui, *mak doo'e*, the second highest mountain in Scotland, situated in the southwest of Aberdeenshire, on the borders of Banffshire, forming one of a cluster of lofty mountains, among which are Brae-riach, Cairntoul and Cairngorm. Its height is 4296 feet.

Ben'nett, James Gordon (1795–1872), an American journalist, founder and editor of the *New York Herald*. He was born in Scotland and was educated for the Catholic priesthood in a seminary at Aberdeen, but the reading of Franklin's *Autobiography* led him to emigrate to America in the spring of 1819. He spent a short time at Halifax, then went to Boston, where, after severe trials, he got employment in a printing office. In 1822 he went to New York. There he did subordinate work for various journals until in 1825 he made his first attempt to establish a journal of his own; the next ten years were occupied in a variety of similar attempts, all of which proved futile During that period, however, he became Washington correspondent of the *Inquirer*, and his letters, written in imitation of the letters of Horace Walpole, attracted attention. Finally, in 1835, appeared the first number of a small one-cent paper, bearing the title of *New York Herald*, and issuing from a cellar, in which the proprietor and editor played also the part of salesman. Through Bennett's immense industry and sagacity, the paper became a great commercial success. He was the first to employ European and financial correspondents, and he also was the first to introduce systematic sale by newsboys. Bennett continued to edit the *Herald* till his death. The successful mission of Stanley to Central Africa in search of Doctor Livingstone was undertaken by his desire, though carried out under his son's direction.

Bennett, James Gordon, Jr. (1841–), an American journalist, son of the famous journalist of the same name. He is the proprietor of the *New York Herald*, the influence of which he maintained and extended by publishing London and Paris editions. At his father's request he projected Stanley's expedition to Africa in search of Livingstone. He was one of the founders of the Commercial Cable Company.

Ben Nev'is, the highest mountain of Great Britain, situated in Scotland, on Loch Eil, at the southern entrance of the Caledonian Canal. Its altitude is 4406 feet, and in clear weather one can obtain from its summit a view which extends nearly across the north of Scotland from sea to sea. The Scottish meteorological society has an observatory on the mountain.

Ben'nington, Vt., a town and county-seat of Bennington co., 37 mi. n. e. of Troy. It has extensive manufactures of woolen and knit goods, machinery, shirts and collars. The Battle of Bennington was fought near here, and the town has a famous battle monument over 300 feet high, commemorating this event. Population in 1910, 6211.

Bennington, Battle of, a battle of the Revolutionary War, fought near Bennington, Vt., Aug. 16, 1777, between a body of Hessians from Burgoyne's invading force, supported by a few British soldiers, loyalists and indians and about 2000 New Hampshire militia under John Stark. The whole British force was either killed, wounded or captured. Reënforcements from the British camp were met by Green Mountain Boys under Seth Warner and suffered a loss of more than 200 killed and 700 wounded. These two battles cost Burgoyne nearly one-seventh of his force and caused many loyalists and indians to desert. A memorial monument was dedicated on the scene of the battle in August, 1891.

Ben'tham, George (1800–1884), an English botanist, nephew of Jeremy Bentham. He early devoted himself to botany. He resided in southern France, where his father had an estate. In company with Sir J. D. Hooker he produced the great descriptive botany, *Genera Plantarum*,

Bentham, Jeremy (1748–1832), an English philosopher and jurist, born in London and educated at Westminster School and Queen's College, Oxford, from which he took the master's degree when but seventeen years of age. After this he studied under Blackstone and prepared for the practice of law. He was, however, more strongly attracted by the theory and philosophy of law, to which he turned his attention. He became the greatest legal and political critic of his day. At the age of twenty-eight he published *A Fragment on Government.* This essay was so well written and showed evidence of such remarkable reasoning, that it at once placed Bentham in the foremost rank of legal critics. Two years later he published another essay, which criticised severely the mode of criminal punishment then in existence and showed a reasonable and practical way of improving the same. It is considered that by this essay and writings that followed Bentham did more than all other writers and critics to revolutionize the systems of punishment then in vogue.

In addition to his works on legal criticism, Bentham published a treatise on ethics and a constitutional code which is considered one of his most important works. He favored universal suffrage and was intensely practical in all his views, being guided by the motto, "The greatest happiness for the greatest number." Like many other reformers, he failed to see that his reforms could be established only through growth in public sentiment, and he was therefore impatient of delay. Many of his principles and theories have been put into practice and have conferred great benefit upon the English people.

Ben'ton, Thomas Hart (1782–1858), an American statesman, born in Hillsborough, N. C. His education began at the University of North Carolina, but he removed to Tennessee and there studied law, being admitted to the bar of Nashville in 1811. He entered the army in the War of 1812, serving as Andrew Jackson's aid-de-camp, and he also raised a regiment, of which he was appointed colonel. When this was disbanded in 1813, he was made lieutenant colonel by President Madison.

In 1815 he moved to Saint Louis, where he practiced law and founded *The Missouri Inquirer*, a journal of strong pro-slavery proclivities. He advocated the admission of Missouri as a slave state, and when it was admitted to the Union in 1820 he was chosen to the United States Senate, where he served for thirty years. He was closely connected with every important measure of his time and was especially loyal to Western interests, being an earnest advocate of the opening of mineral lands to settlement and of the construction of a transcontinental railroad. During the agitation caused by President Jackson's determination to overthrow the United States Bank and to place the currency on a metallic basis, he advocated that measure and received the name of "Old Bullion." It was through his influence that the resolution of censure of the president, passed at that time, was stricken from the record. He took an active part in the discussions in regard to the Oregon boundary and the annexation of Texas, and he was in favor of the Mexican War. He opposed Henry Clay's compromise measures in 1850, and this cost him his seat in the Senate. In 1852 he was elected to the House of Representatives, where he opposed the policy of President Pierce and the Kansas-Nebraska bill. In 1854 he was defeated for Congress by a coalition of his political opponents. He then retired from public life and devoted himself to completing his *Thirty Years' View, or a History of the Working of the American Government from* 1820 *to* 1850.

Benton Har'bor, Mich., a city in Berrien co., on the Pere Marquette and other railroads. It is on the east side of Saint Joseph River and the Benton Harbor Ship Canal, 1½ mi. from Lake Michigan and 60 mi. n. e. of Chicago. Regular lines of steamers connect it with Chicago and Milwaukee. It has a large trade in grain and lumber, is a great fruit-shipping port and has large fruit-packing, pickle and canning factories. Population in 1910, 9185.

Ben'zene or **Ben'zol,** a colorless liquid having a pleasant odor and obtained in large quantities from the distillation of coal tar. It appears as an oil which floats on water. When cooled to freezing point, it solidifies, forming crystals. It burns with a bright flame, and in liquid form dissolves india rubber, gutta-percha, fat and wax. When mixed with nitric acid, benzene forms nitrobenzene, from which aniline is obtained. See Aniline.

Benzine, *ben'zin* or *ben zeen',* a liquid obtained from coal tar and petroleum. It is quite colorless, of a peculiar, ethereal, agreeable odor. It is used by manufacturers of india rubber and gutta-percha on account of its great solvent powers, in the preparation of varnishes, for cleaning gloves and for removing grease-spots from woolen and other cloths. It is highly inflammable, and its vapor when mixed with air is highly explosive. See PETROLEUM.

Benzoin′, a solid, brittle resin that is obtained from the stem or branches of the benzoin tree. It is imported from many places in the East and appears in several varieties. It is nearly tasteless, but is fragrant when rubbed or heated and is used as incense in the Greek and Roman Catholic churches.

Ben′zol. See BENZENE.

Beowulf, *ba′o woolf,* an Anglo-Saxon epic poem, the only existing manuscript of which belongs to the tenth century and is in the British Museum. It recounts the adventures or the hero Beowulf, especially his delivery of the Danish kingdom from the monster Grendel and his equally formidable mother, the slaughter of a fiery dragon and his own death from wounds received in the conflict. The character of the hero is attractive through his noble simplicity and disregard of self. The poem is the longest and most important in Anglo-Saxon literature, but the manuscript is obscure in many places.

Beranger, *ba rahN zha′,* PIERRE JEAN DE (1780–1857), a famous French lyric poet. He applied in 1804 to Lucien Bonaparte for assistance and succeeded in obtaining from him a pension of 1000 francs and, five years later, a university clerkship. In 1828 a fourth collection of his poems was published and this subjected him to a state prosecution, an imprisonment of nine months and a fine of 10,000 francs. In 1833 he published his fifth and last collection. Despite the fact that his first popular song, *King of Yvetot,* contained a gentle satire on Napoleon, Beranger was a sincere admirer of the emperor, and by his numerous songs he did much to implant in the hearts of the people the adoration for the genius of Bonaparte which lasted for generations.

Berber, *bur′bur,* a people spread over nearly the whole of northern Africa, from whom the name Barbary is derived. Generally they are of about middle height; their complexion is brown and sometimes almost black, and they have brown and glossy hair. They are sparely built, but robust and graceful. They till the soil, raise herds of sheep, goats and camels, and live in tents or houses of stone or brick, as the country compels. Three distinct groups are recognized.

Ber′gamo, a city in northern Italy, capital of the province of Bergamo, 39 mi. n. e. of Milan. The city is divided into two distinct parts, both of which afford beautiful scenery. It has a cathedral, a library, the Colleoni Chapel, a city hall and an academy of arts. There are also several manufactories, which carry on extensive business and furnish supplies of silk, woolen, iron goods and organs. Population in 1901, 26,660.

Bergamot, *bur′ga mot,* a fruit tree, variously classed with the orange or the lime or as a distinct species. It is probably of Eastern origin, though it is now grown in southern Europe. The fruit is pear-shaped, of a pale yellow color, and has a fragrant and slightly acid pulp. Its essential oil is in high esteem as a perfume. *Bergamot* is also a name given to a number of different pears and, in the United States, to several pleasingly fragrant plants of the mint family.

Ber′gen, one of the chief seaports of Norway, situated at the head of a deep bay, 125 mi. n. w. of Christiania. The city has beautiful scenery, with a background of lofty mountains. The chief buildings are the cathedral, observatory, general museum, nautical school and public library. The leading manufactures are shipbuilding and barrel-making. Most of the inhabitants are engaged in fishing, which is a very important industry. The city was founded about 1070. It was ravaged several times by pestilences. During the Middle Ages it was an important station of the Hanseatic League. Population in 1901, 72,179.

Bergh, *burg,* HENRY (1820–1888), founder of the American Society for the Prevention of Cruelty to Animals. After studying at Columbia College he went to Europe, where he spent twelve years, and in 1862 he was appointed secretary of the American legation in Saint Petersburg. This position he resigned to devote his time to the protection of animals. The first American society was incorporated, with Mr. Bergh as its president, in 1866. In the face of ridicule and opposition he created a reform recognized as one of the beneficent movements of the age. In 1886 thirty-nine states of the Union, besides Canada, Brazil and the Argentine Republic, had adopted the original laws procured by him for the State of New York. He invented artificial pigeons for the sportsman's gun, and he first established an ambulance for removing injured animals from the street. In 1874 he rescued a little girl from brutal treatment, and this act led to the founding of a Society for the Prevention of Cruelty to Children.

Berg′man, TORBERN OLOF (1735–1784), a Swedish physicist and chemist. He succeeded in the preparation of artificial mineral waters, discovered the sulphureted hydrogen gas of mineral springs and published a classification of minerals on the basis of their chemical character and crystalline forms. His theory of chemical affinities greatly influenced the subsequent development of chemistry.

Berhampur, *bur ham poor′*, the name of two towns of India. 1. A town and military station in the northeast portion of Madras presidency, the capital of Ganjam district. It has considerable trade in sugar and manufactures of silk. Population, about 25,000. 2. A municipal town and the capital of Murshidabad district, Bengal. It was the scene of the first open act of the Sepoy mutiny in 1857. Population, about 25,000.

Beri-beri, *ba′re ba′re*, the local name of a disease often seen in parts of India, Ceylon, Japan and other eastern lands, characterized by paralysis, numbness, difficult breathing and other symptoms. Sometimes madness develops, the patient attacks his companions and often dies in paroxysms. Beri-beri is a form of neuritis, occurring everywhere.

Be′ring or **Beh′ring,** Vitus (1680–1741), a famous Danish navigator. The courage he displayed as captain in the navy of Peter the Great during the Swedish wars led to his being chosen to command a voyage of discovery in the Sea of Kamtchatka. In 1728, and subsequently, he examined the coasts of Kamtchatka, Okhotsk and the north of Siberia, ascertaining the relation between the northeastern Asiatic and northwestern American coasts. Returning from America in 1741, he was wrecked upon the desert island which bears his name, and died there.

Bering Island, the most westerly island of the Aleutian chain, off the east coast of Kamtchatka. It is uninhabited and contains no timber.

Bering Sea, that portion of the North Pacific Ocean extending from the Aleutian Islands to Bering Strait and bounded on the west by the peninsula of Kamtchatka and what is known as the Chico country. During winter it contains floating and pack ice, and most of the year its waters are covered with a dense fog.

Bering Sea Controversy, a dispute between Great Britain and the United States over the seal fisheries in the North Pacific Ocean. Since 1867, the United States had carefully regulated by license the killing of seals on the Pribilof Islands, receiving a royalty for each skin; but after 1886 unlicensed fleets were organized to kill the seals during the winter months, when they are more than three miles from shore, or beyond the jurisdiction of the United States government. In order to restrict the unlicensed killing, the United States set up a claim that Bering Sea was a closed sea, that is, subject to the exclusive jurisdiction of the United States. This was protested by Great Britain, and by a treaty in 1892 the question was referred to arbitration. The tribunal, which consisted of one Englishman, one Canadian, two Americans (Justice John M. Harlan and Senator J. T. Morgan) and one representative each of France, Italy and Sweden and Norway, reported Aug. 15, 1893, a decision which was generally unfavorable to the United States. It led, however, to the adoption of other restrictions. These proved ineffectual, and, in spite of almost constant negotiations since that time, no satisfactory solution of the problem has been found.

Bering Strait, the narrow channel separating Asia from North America and connecting the North Pacific with the Arctic Ocean. Its width at the narrowest point between Cape Prince of Wales and East Cape is about 36 miles. In depth it varies from 175 to 180 feet. During the winter it is frozen, and it is seldom free from fog or haze. It was discovered by Vitus Bering, but was first fully explored by Captain Cook in 1778.

Berkeley, *burk′ly*, Cal., a city in Alameda co., adjoining Oakland, on the Southern Pacific and Santa Fe railroads. It has a beautiful location on the heights overlooking San Francisco Bay. The University of California, the state agricultural college, the Berkeley Bible Seminary and several preparatory schools are located here. besides institutions for the deaf, dumb and blind. Population in 1910, 40,434.

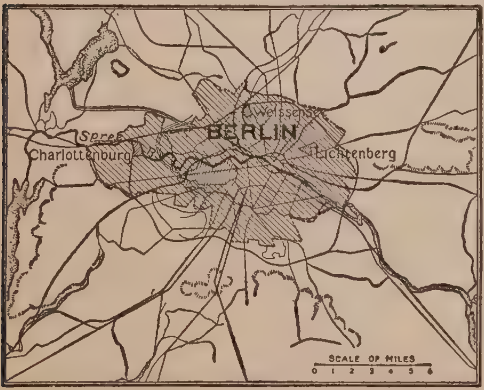
Berkeley, *burk′ly* or *bahrk′ly*, George (1685–1753), bishop of Cloyne in Ireland, a celebrated philosopher who maintained that the belief in the existence of an exterior material world is false and inconsistent with itself; that those things which are called sensible material objects are not external, but exist in the mind and are merely impressions made on our minds by the immediate act of God, according to certain rules termed laws of nature, from which he never deviates. Berkeley is well known for his verses, wherein occurs the expression, "Westward the course of empire takes its way." Among his writings are *Essay Toward a New*

Theory of Vision and a *Treatise Concerning the Principles of Human Knowledge*.

Berkeley, Sir William (1610–1677), a colonial governor of Virginia. He was born near London, studied at Oxford and became governor of Virginia in 1641. When Cromwell gained control of the British government, Governor Berkeley offered an asylum in Virginia to loyalists and kept the colony loyal to the king until 1651. In that year he was compelled to resign, but he was again chosen governor in 1660. Several harsh measures which he adopted caused dissatisfaction, particularly his faithlessness and obstinacy in dealing with the indians, and in 1675 he was barely able to put down a rebellion in the colony (See Bacon s Rebellion). He was recalled and died of a broken heart.

Berkshire, *burk'shir,* **Hills,** the name applied to the hilly region in Berkshire co., Mass. The mountains are a continuation of the Green Mountains of Vermont and reach a height of over 3000 feet in Greylock. The scenery of this region is especially beautiful and renders it famous as a summer resort.

Berlin, *burlin'* or *ber'lin,* the largest city in Germany, capital of the Prussian dominions and of the German Empire, situated in the province of Brandenburg, on a sandy plain on both sides of the Spree. The original portion of the city lies on the right bank of the river, and is irregularly built. The more modern portion is regular in its plan, and the streets are lined with imposing and well-built edifices, mostly of white freestone or brick covered with a coating of plaster or cement. Of the numerous bridges, the finest is the Castle (Schloss) Bridge, 104 feet wide, which has eight piers, surmounted by colossal groups of sculpture in marble. The principal and most frequented street, Unter den Linden, so called from its double rows of linden trees, is about two-thirds of a mile in length and 160 feet wide. At the east end of this street, and round the Lustgarten (a square with which it is connected by the Schloss Bridge), are clustered the principal public buildings of the city, while at the west end is the Brandenburg Gate, after the pattern of the Propylaea at Athens, regarded as one of the finest portals in existence. Immediately beyond this gate is the zoölogical garden (*thiergarten*), an extensive and well-wooded park containing the palace of Bellevue and places of public amusement. There are also several other public parks. The principal public buildings are the royal palace, or Schloss, a vast rectangular pile; the museum, opposite the Schloss, a fine Grecian building, with an extensive collection of sculpture and painting, and the royal theater, a fine Grecian edifice. The royal library and the palace of the emperor are united. The former contains 1,000,000 volumes and 30,000 manuscripts and charts. The new cathedral, the university, the exchange, the Italian opera house, the principal Jewish synagogue, the town hall and the old architectural academy are all beautiful structures. Among the most remarkable of modern monuments are the National Monument to Emperor William I. opposite the royal palace, the monument to Frederick the Great, in Unter den Linden, and the Peace Monument of Victory, on the Königs Platz.



The literary institutions of the city are numerous and excellent, and Berlin ranks among the first cities as a center of learning. Besides the University of Berlin (See Berlin, University of), there are the academy of sciences, the academy of fine arts, the military academy, the royal school of agriculture and the technical high school or academy of architecture and industry.

The manufactures of Berlin are various and extensive, including steam engines and other machinery, brass founding and various articles of metal, sewing machines, paper, cigars, pottery and porcelain, pianos and artificial flowers. Among its chief industrial establishments are the royal iron-foundry and the royal porcelain factory. The chief articles of commerce are grain, cattle, wool and timber.

The government of Berlin is republican, but so disposed as to place the virtual control of the city in the hands of those who own property. The council, consisting of 126 members, is elected for six years, the term of one-third expiring every two years. The council elects the mayor and is the source of governmental authority in the city. The executive branch of the government is in the hands of the mayor, with a body of thirty-four magistrates, one-half of whom are salaried.

The oldest parts of Berlin were originally poor villages and first rose to some importance under Markgraf Albert (1206–20); yet about two centuries ago Berlin was still a place of little consequence. The first important improvement was made by the great Elector Frederick William, who laid out the Unter den Linden, and in whose time the city numbered 20,000 inhabitants. Under his successors, Frederick I and Frederick the Great, the city was rapidly enlarged and improved. In 1871 Berlin became the capital of the German Empire; its growth since then has been marvelous. Population in 1905, 2,040,148.

Berlin, *bur'lin,* a town of Ontario, Canada, about 60 mi. w. s. w. of Toronto, on the Grand River and on the Grand Trunk railroad. It has manufactures of furniture, leather, boots and shoes, pianos and gloves. It contains a Roman Catholic college and fifteen churches. Population in 1901, 9747.

Berlin, N. H., a city of Coos co., on the Androscoggin River and on the Grand Trunk and the Boston & Maine railroads. The city is beautifully located near the base of Mount Washington. It has valuable water power; one of the largest pulp mills in the United States is located here, and there are also paper mills, lumber yards and shoe factories. Population in 1910, 11,780.

Berlin, CONGRESS OF. At the close of the Russo-Turkish War in 1878, Russia obtained from Turkey a treaty highly favorable to herself. The other European powers, however, were far from satisfied with it, as it gave too much power to Russia in southeastern Europe. A congress, therefore, of representatives from Germany, Austria, France, England, Italy, Russia and Turkey met at Berlin in June, 1878, to modify the terms of peace. The foremost statesmen of Europe were present, among them Beaconsfield and Salisbury from England, Prince Gortchakoff and Count Shuvaloff from Russia, Bismarck and General Von Bülow from Germany, Andrassy from Austria-Hungary, M. Waddington from France and counts Corti and de Launay from Italy.

By the Treaty of Berlin, Russia was robbed of much that she had gained by her victory over Turkey. By the Treaty of San Stefano, Bulgaria and Eastern Rumelia had been created an independent state, but the Congress of Berlin made of the northern part of Bulgaria proper an autonomous state, and of the southern, Eastern Rumelia, a province under Turkish dominion. Servia, Montenegro and Rumania were allowed to remain independent, but Austria was given administrative control of Bosnia and Herzegovina. The principle emphasized by the Congress was that the Turkish Empire in Europe was not to be dismembered, and that questions concerning it were to be settled, not by any one power, but by all the powers in conference.

Berlin, TREATY OF. See BERLIN, CONGRESS OF.

Berlin, UNIVERSITY OF, one of the most famous universities in the world, established at Berlin in 1810, during the reign of Frederick William III, and at the suggestion of Wilhelm von Humboldt, who was then minister of education. The university includes departments of theology, jurisprudence, medicine and philosophy, which includes arts and sciences. It also has in connection with it several institutions. such as the institutes of physics and physiology, clinics, seminaries and museums. It is supported by the State, and is under the control of the minister of education. The instructors and professors number about 400, and the usual attendance is 11,000. Students of all nationalities are admitted, and women, except those of Germany, are admitted to certain departments under some restrictions. The library contains 160,000 volumes, besides a large number of pamphlets and theses. See UNIVERSITY.

Berlin Decree. See CONTINENTAL SYSTEM.

Berlioz, *bare'le ose,* HECTOR (1803–1869), a French composer, the leader of the modern, or Romantic, school of music in his native country. He forsook medicine to study music at the Paris Conservatoire, where he gained the first prize in 1830, with his cantata, *Sardanapale.* Thereafter he achieved a wide reputation for the composition of so-called *program music,* in which a story is realistically expressed by the music. His symphony, *Herold en Italie,* his opera, *Les Troyens* and his dignified *Te Deum* are now considered masterpieces, though scarcely recognized during his lifetime.

Bermu'da Grass, a grass cultivated in the West Indies, United States and Europe. It is a valuable fodder and lawn grass in warm climates where the soil is not very wet.

Bermuda Islands or **Somers Islands,** a cluster of small islands in the Atlantic Ocean, belonging to Great Britain and having an area of about 20 sq mi. They are farther north than any other islands of coral formation, due to the warm water of the Gulf Stream. They also differ from other atolls in containing hills, some 260 feet high, formed of windblown coral sand, which rain has made into solid rock. The Bermudas were first discovered by Juan Bermudez, a Spaniard, in 1522, and the first settlement was made in 1609 by Sir George Somers, an Englishman. These islands form an important British naval and military station. Population, 17,000.

Bern or **Berne,** *burn,* a town in Switzerland, capital of the canton of Bern, and, since 1848, of the whole Swiss Confederation. It is situated 1700 feet above the sea and is nearly surrounded by the River Aar. No city in Switzerland excels it in beauty and it is among the most regularly built towns in Europe. Among the public buildings are the great Gothic cathedral, built between 1421 and 1502; the church of the Holy Spirit; the federal-council buildings, or parliament house, commanding a splendid view of the Alps; the university; the town house a Gothic edifice of the fifteenth century, and the mint. Bern has an academy, several literary societies and an excellent public library. The manufactures are woolens, linens, silk stuffs, stockings, watches, clocks and toys. Bern became a free city of the Empire in 1218. In 1353 it entered the Swiss Confederacy. Population in 1900, 63,994.

Bernadotte, *bur na dot′*, Jean Baptiste Jules. See Charles XIV John.

Bernard, *bur′n′rd* or *bur nahrd′*, Saint (1091–1153), of Clairvaux, one of the most influential ecclesiastics of the Middle Ages, born at Fontaine, Burgundy. He became a monk at Citeaux, and was the first abbot of Clairvaux, the great Cistercian monastery near Langres. He secured the condemnation of Abelard for heresy. Seventy-two monasteries owed their foundation or enlargement to him, and he left 439 epistles, 340 sermons, 12 theological and moral treatises and a few hymns. Luther said of him, "If there ever lived a God-fearing and holy monk, it was Saint Bernard of Clairvaux." He was canonized in 1174.

Bernhardt, Rosine, called Sarah (1844–), a noted French actress. She was of Jewish descent, but was baptized into the Christian faith according to her father's wish, and spent the early years of her life in a convent. Upon entering the Paris Conservatory in 1858, she received second prizes in tragedy and comedy. Her professional début in 1862 was made in Racine's *Iphegenie,* but was not exceptionally successful. She then took up burlesque, but failed to attract attention. Her first real success was in *Ruy Blas,* in 1867. In 1872 Madame Bernhardt was recalled to the Théatre Français, where she had previously failed, and soon afterward achieved a distinct triumph in *Le Sphinx,* and later as Doña Sol in Victor Hugo's *Hernani.* She appeared in London in 1879 and aroused great enthusiasm, and shortly afterward she made a very successful tour through the United States. In the meantime she had abruptly severed her relations with the Théatre Français and was forced to pay $20,000 for breach of contract. In 1882 she married Damala, a Greek actor, but was separated from him in the following year. Thereafter she appeared successively in *Fedora, La Tosca, Gismonde* and *La Samaritaine* and in 1900 took the parts of Hamlet and L'Aiglon. She toured the United States in *L'Aiglon* with Coquelin, with the same remarkable success that she had achieved on former visits. In 1906 she made a farewell tour of the United States, appearing in *La Sorciere, Le Femme de Claude, Phedre, Magda, Sapho, La Dame aux Camelias, Fedora, La Tosca* and *Adrienne Lecouvreur.* She visited all parts of the country, and the general verdict was that her work was on a higher plane than ever. The most favorable comment was called forth by her presentation of Marguerite Gautier in *La Dame aux Camelias.* Besides attaining a reputation for ability and remarkable versatility in her art, she has also produced work of high excellence as painter, sculptor and author.

Madame Bernhardt is fascinating in her caprices, both on the stage and in her private life, and, in spite of eccentricities and independence of forms, she has become the foremost French actress of her time.

Bernini *ber ne′ne,* Giovanni Lorenzo (1598–1680), an Italian sculptor and architect. He showed remarkable talent at an early age and succeeded in gaining the patronage of all the popes who lived in his lifetime. Among his important works are a colossal equestrian statue of Louis XIV, a statue of Charles I of England, monuments of Urban VIII and Alexander VII in Saint Peter's, and the great altar of Saint Peter's, beneath the center of the dome. *Apollo and Daphne* and *Ecstasy of Teresa* are some of his other productions.

Bersaglieri, *ber′sa lya′re,* a corps of Italian sharpshooters, organized early in the reign of

Victor Emmanuel, by General Alessandro della Marmora. Two battalions took part in the Crimean War and distinguished themselves at the battle of Tchernaya (Aug. 16, 1855). They are the "show" soldiers of the Italian army, and at reviews they execute all movements at a sharp run.

Berthier, *bare tya'*, ALEXANDER (1753–1815), prince of Neuchatel and Wagram, marshal of the French Empire. He served in America with Lafayette, and after some years' service in France he joined the army of Italy as general of division and chief of the general staff, receiving in 1798 the chief command. In this capacity he entered Rome, abolished the papal government and established a republic. He followed Bonaparte to Egypt as chief of the general staff, was appointed by him minister of war, accompanied him to Italy in 1800, and again in 1805, to be present at his coronation, and was appointed chief of the general staff of the grand army in Germany. After Napoleon's abdication he was taken into the favor and confidence of Louis XVIII.

Bertillon, *bare te yoN'*, **System,** a system for the identification of criminals, invented by Doctor Bertillon in 1879 and published in 1885. The means used are of two forms, (1) *anthropometrical*, consisting of measurements of the human body, especially of the bones (since they never change in adults); (2) *descriptive*, giving general accounts of the prisoner's appearance, including eyes, hair, complexion and special marks or deformities. These descriptions are classified and filed.

Ber'yl, a colorless, yellowish, bluish or less brilliant green variety of emerald, the prevailing hue being green of various shades, but always pale. The crystals, which are six-sided, are usually longer and larger than those of the precious emerald, and its structure is more distinctly foliated. The best beryls are found in Brazil, in Siberia, Ceylon and in Dauria, on the frontiers of China. Beryls are also found in many parts of the United States. Some of the finer and transparent varieties of it are often called *aquamarine*. See AQUAMARINE.

Berze'lius, JOHN JAMES, Baron (1779–1848), a Swedish chemist. He studied medicine at Upsala and was appointed lecturer in chemistry in the Stockholm military academy in 1806, and the following year professor of pharmacy and medicine. He discovered selenium and thorium, first exhibited calcium, barium, strontium, tantalum, silicium and zirconium in the elemental state, and investigated whole classes of compounds, as those of fluoric acid, the metals in such ores as platinum, tantalum, molybdenum, vanadium and sulphur salts. He also introduced a new nomenclature and classification of chemical compounds. His writings include an important *Text-book of Chemistry*.

Besançon, *be'zaN'soN'*, a city in France, capital of the department of Doubs, and formerly of Franche-Comté, situated on the Doubs River. The city was a Gallic stronghold in the time of Caesar, and it has several Roman remains, among which are a triumphal arch built by Marcus Aurelius, an amphitheater, an aqueduct and a theater. Prominent buildings are a cathedral, the prefecture, the palace of Cardinal Granvella, besides a college, a library and a museum. The manufacturing industry is important, the chief articles including watches, machinery, iron and steel ware and porcelain. Besançon is very well built and is one of the strongest towns in France, being fortified with an apparently impregnable citadel and forts on all sides. The city was the ancient Vesontio, capital of the Sequani, whom Caesar, in 58 B. C., expelled. Population in 1901, 55,362.

Besant, *be zant'*, SIR WALTER (1836–1901), an English novelist and critic, born at Portsmouth and educated at King's College, London, and Christ's College, Cambridge. After serving as senior professor of mathematics in the Royal College of Mauritius from 1861 to 1867, he returned to London and formed a literary partnership with James Rice. Among the novels which they produced together are *Ready Money Mortiboy*, *The Golden Butterfly* and *The Seamy Side*. Of the novels written by Besant after the death of Rice, the best known, *All Sorts and Conditions of Men*, dealt with life in the East Side of London and resulted in the building of the People's Palace in East London. *Dorothy Foster*, *The Orange Girl* and *The Alabaster Box* are among his other novels. Besant was the founder of the Society of Authors, and the editor of the *Author*, the publication of the society. He was knighted by Queen Victoria in 1895.

Bessara'bia, a Russian province between the Pruth and Danube and the Dniester, covering an area of 17,600 sq. mi. It came under the power of the Turks in 1503, was taken by the Russians in 1770 and was ceded to them by the Peace of Bucharest in 1812. The southeast extremity was given to Turkey in 1856, but it was restored to Russia by the Treaty of Berlin, 1878, in exchange for the Dobrudsha. It is fertile in grain, but is largely used for pasturage. The capital is Kishinev. Population, chiefly Wallachians, gypsies and Tartars, 1,933,426.

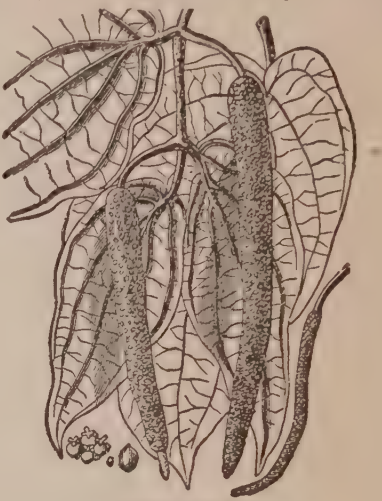
Bes'semer, Ala., a city in Jefferson co., 11 mi. s. w. of Birmingham, on the Louisville & Nashville, the Southern, the Georgia Pacific and other railroads. It was founded in 1887 as a manufacturing place, on account of the coal and iron deposits in its vicinity. There are now blast furnaces, coke ovens, machine shops and mills, while the making of fire brick is also an important industry. Among the cities of the state it is seventh in population and sixth in taxable property. Population in 1910, 10,864.

Bessemer, Henry (1813–1898), an English engineer and inventor, born in Hertfordshire, chiefly known in connection with the celebrated process for making steel, which bears his name—a process which has effected an entire revolution in the steel trade. This discovery was one of the most important of the nineteenth century, and to it is due the use of steel in the frames of buildings and in rails which are so constructed as to permit the present system of railway traffic. Bessemer distinguished himself by many other inventions and scientific improvements. He discovered a new process for the manufacture of bronze powder and made a number of important improvements in type-casting machinery. In 1789 Bessemer received the honor of knighthood. See Steel, subhead *Bessemer Steel.*

Bessemer Steel. See Steel.

Bessey, *bes'sy,* Charles Edwin (1845–), an American botanist and educator, born at Wilton, Ohio. At the age of twenty-five he was appointed professor of botany in Iowa Agricultural College, and fourteen years later he was elected professor of botany in the University of Nebraska. He soon attained rank among the leading botanists of the world and published numerous scientific works. The best known of these are *Botany for High Schools and Colleges, Essentials of Botany* and *Reports on Insects.* He was editor of the department of botany for *Johnson's Universal Cyclopedia.*

Be'tel or **Be'tle,** a species of pepper, a creeping or climbing plant, native of the East Indies. The leaves are employed to make, with a piece of the areca or betel nut, a little lime pellet, which is extensively chewed in the East. The pellet is hot and acrid, but has aromatic and astringent properties. It tinges the saliva, gums and lips a brick-red, blackens the teeth and causes them to decay rapidly. It is doubtful if any good comes from its use. but the custom is so universal with men, women and children, and so continuous, that the proper handling of betel is an important portion of the etiquette in every ceremonial meeting. The betel is too biting for pleasure to a person not uesd to it, and it makes one dizzy and sleepy, A number of different plants nearly related to the peppers, the leaves of which have similar properties, are extensively cultivated and are used by the natives in the same way. Where the climate is not suitable, because of dryness or cold, the vines are cultivated under sheds.



BETEL VINE

Betel Nut, the kernel of the fruit of a beautiful palm, found in India and the East, and named from being chewed along with betel leaf. When ripe it is of the size of a cherry, conical in shape, brown externally and mottled internally, like a nutmeg. Ceylon alone exports 3500 tons annually.

Beth'any, (now called El-Azariyeh or Lazarieh), anciently a village of Palestine, at the base of Mount Olivet, about 2 mi. e. of Jerusalem. It was the home of Martha, Mary and Lazarus and was near the place where the ascension of our Lord is said to have taken place.

Bethesda, *be thez'da,* (house of mercy), a pool in Jerusalem. near Saint Stephen's Gate and the Temple of Omar. It is 460 feet long, 130 feet broad and 75 feet deep, and is now known as Birket Israel. See *John* v, 2–9.

Beth'lehem, Pa., a borough in Northampton co., 57 mi. n. of Philadelphia. on the Lehigh river and canal, and on the New Jersey Central, the Lehigh Valley and other railroads. The industries include extensive iron, steel, zinc and graphite works and silk and knitting mills. Bethlehem was settled by the Moravians in 1741 and is the center of that sect in the United States. Here they have a theological seminary and a school for young ladies. Other points of interest are the public library, Saint Luke's Hospital, the fine Church of the Nativity, and two bridges seven hundred feet long, spanning the river to South Bethlehem. Population in 1910, 12,837.

Bethlehem (house of bread), a town of Palestine, memorable as the birthplace of Christ. 5½ mi. s. w. of Jerusalem. The modern town is Beit Lahm. There are three convents, one each for Catholics, Greeks and Armenians, and the Church of Saint Mary. A richly adorned grotto, lighted with silver and crystal lamps, under the choir of the fine church built by Justinian, is shown as the actual spot where Jesus was born. The chief trade of the place is in crosses, beads and relics. Population, 8000, most of whom are Christians.

Beust, *boist*, FRIEDRICH FERDINAND, Count von (1809–1886), a Saxon and Austrian statesman. He adopted the career of diplomacy, and as a member of embassies or as ambassador for Saxony, he resided at Berlin, Paris, Munich and London. His influence was on the side of Austria against Prussia before the war of 1866, and after the war, finding his position in Saxony difficult, he entered the service of Austria as minister of foreign affairs, became president of the ministry and later, imperial chancellor. It is for his reorganization of the Empire while in this position that Beust is chiefly noteworthy. From 1871 to 1878 he was ambassador in London, and from 1878 to 1882, in Paris.

Bev'eridge, ALBERT JEREMIAH (1862–), an American statesman, born on a farm in Ohio. He went with his parents to Illinois soon after the close of the Civil War, and later moved to Indiana, where he attended De Pauw University, graduating in 1885. He studied law, and after his admission to the bar he rapidly attained prominence. In 1899 he was elected United States senator from Indiana as a Republican and soon became known as one of the most forceful speakers in that body. He has contributed many articles to magazines, some of which have been republished under the title *The Young Man and the World.*

Bev'erly, MASS., a city in Essex co., 2 mi. n. of Salem, on the Boston & Maine railroad. There are extensive manufactures of shoes, clothing, leather and carriages. The New England Institute for the Deaf and Dumb is located here, and there are many handsome residences of Boston business men. Electric railways connect the city with the surrounding country. Population in 1910, 18,650.

Bewick, *bu'ik*, THOMAS (1753–1828), a celebrated English wood-engraver, founder of modern wood-engraving. He established his fame by his *History of Quadrupeds*, the *History of British Birds*, his greatest work, and the engravings for Goldsmith's *Traveler* and *Deserted Village*, Parnell's *Hermit* and Somerville's *Chase.*

Beyrout, *ba'root.* See BEIRUT.

Be'za, THEODORE (1519–1605), next to Calvin the most distinguished man in the early reformed church of Geneva. He was born of a noble family at Vezelay, Burgundy, and was educated in Orleans under Melchior Volmar, a German scholar devoted to the Reformation. In 1539 Beza went to Orleans to study law, and to Paris, where he lived for a time a reckless life. Ten years later he became professor of Greek at Lausanne. He rendered service to the cause of the reformers at the court of the king of Navarre and in attendance upon Condé and Coligny. Among his many works, his *History of Calvinism in France from 1521 to 1563* and *Theological Treatises* are still esteemed, but his theological writings are seldom read. He is most famous for his Latin translation of the New Testament.

Beziers, *ba zya'*, a town in France, situated 38 mi. s. w. of Montpellier and a short distance from the Mediterranean. It is surrounded by an ancient wall and has narrow streets, though it is quite well built. The cathedral, a Gothic structure, is the most important building. The leading manufactures are woolens, silks, knit goods, spirits and chemicals. Early in the thirteenth century Beziers was the scene of a massacre of the Albigenses. Population in 1901, 49,214.

Bheel or **Bhil**, *beel*, a race inhabiting the hills of central India. The English subdued them, and during the Sepoy rebellion the Bheels favored the English. The hill Bheels wear little clothing and live precariously on grain, wild roots, fruits and vermin, but the lowland Bheels are showing interest in civilization. Their total numbers are about 750,000.

Bhutan, *b'hoo tahn'*, an independent state of Asia, situated in the eastern Himalayas, bounded on the s. by Bengal and on the n. and e. by Tibet. The mountains in this region are covered with extensive forests, and some parts of the territory are fertile, the chief crops being millet, wheat and rice. The manufactures are coarse cloths, silks, arms and the production of musk. The inhabitants are allied to the Tibetans, and they are everywhere degraded. They are Buddhists and have two rulers, a spiritual ruler, the Dharm Raja, and a secular ruler, Del Raja. The capital is Punakha, or Dosen. In 1865 the part of Bhutan known as Duars was annexed by the British. Population, estimated at 200,000.

Biafra *be ah′fra*, Bight of, an African bay running in from the Gulf of Guinea, having the Kamerun Mountains at its inner angle, and containing the island of Fernando Po.

Bi′as, one of the seven wise men of Greece. He lived about the middle of the sixth century b. c. and appears to have been in repute as a political and legal adviser. Many sayings of practical wisdom attributed to him have been preserved.

Bible (books, from *biblos*, the inner bark of the papyrus, on which the ancients wrote), the collection of the sacred writings or Holy Scriptures of the Christians. Its two main divisions, one received by both Jews and Christians, the other by Christians only, are termed Testaments. The original languages of the Bible are Aramaic, Greek and Hebrew, the latter being the best adapted for the many styles of composition. The Jewish religion being represented as a compact between God and the Jews, the Christian religion was regarded as a new compact between God and the human race; and the Bible is, therefore, properly divisible into the Writings of the Old and New Covenants. The books of the Old Testament received by the Jews were divided by them into three classes: 1, The Law, contained in the Pentateuch. 2, The Prophets, comprising *Joshua*, *Judges*, *I* and *II Samuel*, *I* and *II Kings*, *Isaiah*, *Jeremiah*, *Ezekiel* and the twelve minor prophets. 3, The Ketubim (*holy writings*) containing the *Psalms*, *Proverbs*, *Job*, in one division; *Ruth*, *Lamentations*, *Ecclesiastes*, *Esther*, the *Song of Solomon*, in another division; *Daniel*, *Erza*, *Nehemiah*, *I* and *II Chronicles*, in a third. These books are extant in the Hebrew language; others have been rejected from the canon as apocryphal by Protestants, and are found only in Greek or Latin. The whole Bible, including parts of the Apocrypha, is sacred to the Roman Catholics.

The books of Moses, with other sacred writings, were deposited, according to the Bible, in the tabernacle near the ark. They were removed by Solomon to the temple, and on the capture of Jerusalem by Nebuchadnezzar they probably perished. According to Jewish tradition Ezra, with the assistance of the great synagogue, collected and compared as many copies as could be found, and from this collation an edition of the whole was prepared, with the exception of the writings of Ezra, Malachi and Nehemiah, added subsequently, and certain obviously later insertions in other books. When Judas Maccabaeus repaired the temple, he placed in it a correct copy of the Hebrew scriptures. This copy was carried to Rome by Titus. The exact date of the Hebrew canon is uncertain, but no work known to be written later than about 100 years after the captivity was admitted into it by the Jews of Palestine. The Alexandrian Jews, however, were less strict and admitted many later writings, forming what is now known as the Apocrypha, in which they were followed by the Latin Church. The Protestant churches at the reformation gave in their adherence to the restricted Hebrew canon, though the Apocrypha was long included in the various editions of the Bible. The division into chapters and verses, as it now exists, is of comparatively modern origin, though divisions of some kind were early introduced. About the middle of the sixteenth century the verses were for the first time marked by numbers.

The earliest and most famous version of the Old Testament is the Septuagint, or Greek translation, executed by Alexandrian Greeks, and completed probably before 130 b. c. This version was adopted by the early Christian church and by the Jews themselves and has always held an important place in the interpretation and history of the Bible. The Syriac version, the Peshito, made early in the second century after Christ, is celebrated for its fidelity. The Coptic version was made from the Septuagint, in the third or fourth century. The Gothic version, by Ulphilas, was made from the Septuagint in the fourth century, but mere insignificant fragments of it are extant. The most important Latin version is the Vulgate, executed by Jerome, partly on the basis of the original Hebrew, and completed in 405 a. d.

The printed editions of the Hebrew Bible are very numerous. The first edition entire was printed at Soncino in 1488.

The books of the New Testament were all written in Greek, unless it be true, as some critics suppose, that the gospel of *Saint Matthew* was originally written in Hebrew. Most of these writings have always been received as canonical;

but the *Epistle to the Hebrews*, commonly ascribed to Saint Paul, that of Saint *Jude*, the second of *Peter*, the second and third of *John* and the *Apocalypse*, have been doubted. The three oldest manuscripts are: 1, the Sinaitic manuscript, discovered by Tischendorf in a convent on Mount Sinai in 1859, assigned to the middle of the fourth century; 2, the Vatican manuscript at Rome, of similar date; 3, the Alexandrian manuscript in the British Museum, assigned to the latter half of the sixth century. Each manuscript contains also in great part the Septuagint Greek of the Old Testament. The Vulgate of Jerome embraces a Latin translation of the New, as well as of the Old, Testament, based on an older Latin version. The division of the text of the New Testament into chapters and verses was introduced later than that of the Old Testament, but it is not precisely known when or by whom.

Of translations of the Bible into modern languages the English and the German are the most celebrated. Considerable portions were translated into Anglo-Saxon, including the Gospels and the Psalter. Wycliffe's translation of the whole Bible (from the Vulgate), begun about 1356, was completed shortly before his death, 1384. The first printed version of the Bible in English was the translation of William Tyndale, whose New Testament was printed in quarto at Cologne in 1525, a small octavo edition appearing at the same time at Worms. He also published the Pentateuch in 1530 and translated some of the prophetical books. Our translation of the New Testament is much indebted to Tyndale. A translation of the entire Bible, undertaken at the instance of Thomas Cromwell, was published by Miles Coverdale in 1535 and, being made from German and Latin versions, was inferior to Tyndale's. The first Bible printed by authority in England was an edition with a preface by Cranmer, hence called *Cranmer's Bible*. A royal proclamation in 1540 ordered it to be placed in every parish church. This continued, with various revisions, to be the authorized version till 1568. In 1557–1560 an edition appeared at Geneva, based on Tyndale's—the work of Whittington, Coverdale, Goodman, John Knox and other exiles, and commonly called the *Geneva*, or *Breeches*, *Bible*, from "breeches" standing instead of "aprons" in *Genesis* III, 7. This version, the first printed in Roman letters, and also the first to adopt the plan, previously adopted in the Hebrew, of a division into verses, was for sixty years the most popular in England and was allowed to be printed under a patent of monopoly in 1561. It omitted the Apocrypha, left the authorship of the *Epistle to the Hebrews* open and put words not in the original in italics. The *Bishop's Bible*, published 1568 to 1572, revised by Archbishop Parker and eight bishops, succeeded Cranmer's as the authorized version, but did not commend itself to scholars or people. In 1582 an edition of the New Testament, translated from the Latin Vulgate, appeared at Rheims, and in 1609–1610 the Old Testament was published at Douay. This is the version recognized by the Roman Catholic Church.

In the reign of James I a Hebrew scholar, Hugh Broughton, insisted on the necessity of a new translation, and at the Hampton Court Conference (1604) the suggestion was accepted by the king. The work was undertaken by forty-seven scholars, divided into six companies, two meeting at Westminster, two at Oxford and two at Cambridge, while a general committee meeting in London revised the portions of the translation finished by each. The revision was begun in 1607 and occupied three years, the completed work being published in folio in 1611 and known as *King James's Bible*. Through the general accuracy of its translation and the purity of its style, it superseded all other versions. In response, however, to a wide-spread desire for a translation even freer from errors, the Convocation of Canterbury in 1870 appointed a committee to consider the question of revising the English version. Their report being favorable, two companies were formed, one for the Old Testament and one for the New, consisting partly of members of the Convocation and partly of outside scholars. Two similar companies were also organized in America, to work along with the British scholars. The result was that the revised version of the New Testament was issued in 1881; that of the Old Testament appeared in 1884.

Bibliog'raphy, the knowledge of books, in reference to the subjects discussed in them, their different degrees of rarity, reputed and real value, the materials of which they are composed and the rank which they ought to hold in the classification of a library. The subject is sometimes divided into *general*, *national* and *special* bibliography, according as it deals with books in general, with those of a particular country or with those on special subjects or of a special character, as early printed books or anonymous books. A subdivision of each of these may be made into *material* and *literary,* according as books are viewed in regard to their mere externals or in regard to their contents. For American books, the *American Catalogue* is the most comprehensive bibliography, while other important ones are Scribner's *Bibliographical Guide to American Literature* (1856) and Duyckink's *Cyclopaedia of American Literature.* There are among bibliographies dealing with special subjects such works as *The Literature of American History* and Baker's *Guide to the Best Fiction.*

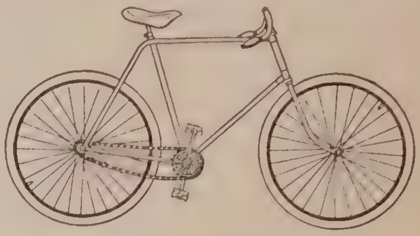
Bib′lioma′nia, a passion for collecting rare and curious books. Bibliomania has manifested itself to a remarkable extent during the last hundred years. With the bibliomaniac, or more properly *bibliophile,* the utility of a book is of secondary importance, while its rarity is the first, and sometimes only, requisite. First copies of books, scarce editions, the first publications of authors afterwards famous, and *editions de luxe,* are among the treasures sought by the bibliophile. Books of the early printers, especially the Gutenberg, Caxton, Aldine and Elzevir books, bring enormous prices. A Bible, supposed to date from the year 1450, and to be one of the oldest printed books in existence, sold in 1884 for £3900. There are in different countries a number of clubs of booklovers, such as the Grolier Club in New York, which reprint rare works for the use of the members only. The beautiful and costly books from the Kelmscott Press of the late William Morris in England are in great demand among collectors of artistically prepared editions.

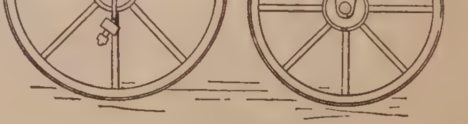
Bibliotheque Nationale, *be ble o tek′ nasyo nal′,* the French national library in Paris. This is the largest library in the world, and contains over 2,500,000 printed volumes and maps, about 100,000 manuscripts, more than 250,000 engravings and 150,000 coins and cameos. The fact that there are so many printed volumes is due to the decree of 1536, that one copy of every book printed in France shall be deposited in the national library.

Biceps, *bi′seps,* the large muscle in front of the arm, attached at its upper extremity to the scapula and at its lower, by a tendon, to the radius. By its action the elbow is bent, or if the elbow be made a fixed point the shoulder is moved, as may be seen in climbing a pole "hand over hand." The corresponding muscle on the back of the arm is called the triceps. See MUSCLES.

Bichat, *be sha′,* MARIA FRANCOIS XAVIER (1771–1802), a French anatomist and physiologist, born at Thoriette. Bichat was the first who recognized the identity of the tissues in the different organs, and he is justly considered the founder of general anatomy.

Bi′cycle, a light vehicle having two wheels, one behind the other, attached to a frame upon which a seat is mounted, and propelled usually by the rider's feet acting upon cranks or levers. The first bicycle was invented in 1816 and was known as the *draisine,* from its inventor, Baron von Drais. It had two wheels connected by a bar, and the rider propelled the machine by kicking the ground alternately with his right and left foot. An improvement upon the draisine was the *curricule,* also called *hobby horse* and *dandy horse,* invented by one Johnson of England. This was followed by the *velocipede,* which in form and principle of construction resembled quite closely the modern bicycle, but the frame and wheels were of wood, the machine was propelled by the forward wheel and in construction was somewhat clumsy. The velocipede was introduced into the United States in 1866, and in the next three years velocipede-riding became very popular.


MODERN BICYCLE


DANDY HORSE

The velocipede gave way to the high bicycle or *ordinary,* which was introduced in 1873, and for about ten years was in general use in America and Europe, when it was displaced by the modern *safety bicycle.* With the advent of the safety, bicycling became very general, and between 1888 and 1900 the manufacture of bicycles in the United States developed into a very important industry. During these years the wheel was used more as an instrument of sport and pleasure than as a vehicle for business. After 1900 the popularity of the bicycle declined, and it was used almost wholly as a business convenience. As such it is now in quite general use in all towns and in many places on country roads. A *motor cycle* consists of the ordinary bicycle fitted with a gas engine for propelling it. Since 1903 these machines have come into quite common use.

The bicycle is a convenient vehicle, since it affords easy, quick and cheap transportation on city streets and in the country, where the roads are good. Its extensive use, together with the influence of the League of American Wheelmen, has accomplished considerable in promoting the good roads movement throughout the country.

Bid′deford, Me., a city in York co., 15 mi. s. w. of Portland, on the Boston & Maine railroad and on the Saco River, 6 mi. from the ocean. The falls in the river furnish water power for manufactures, which include cotton goods, boxes and lumber. The city also exports a fine quality of granite. It derives its name from Bideford, England, was settled under a patent in 1630 and was given a city charter in 1855. The place now has a wide reputation as a summer resort. There are many churches, a public library and an electric line to Old Orchard Beach. Population in 1910, 17,079.

Bid′dle, James (1783–1848), an American naval officer. He was educated at the University of Pennsylvania, entered the navy as a midshipman in 1800, served in the war with Tripoli and was captured in the frigate *Philadelphia* and confined for four months. During the War of 1812 he was on the *Wasp* and led in the action against the *Frolic*, which he commanded after its capture. Both vessels were taken by the British ship *Poitiers* and were conveyed to the Bermudas. After his exchange in March, 1813, he was given command of a flotilla of gunboats on the Delaware and was then transferred to the *Hornet*. He captured the *Penguin* in March, 1813, for which Congress gave him a gold medal. In 1815 he became captain. During his command of the Mediterranean squadron he negotiated a commercial treaty with Turkey, and he was engaged in diplomatic service in China in 1845.

Biddle, John (1615–1662), founder of the modern English Unitarian church. He was educated at Oxford and became master of a free school at Gloucester. He was repeatedly imprisoned for his views. A general act of oblivion in 1652, by the order of Oliver Cromwell, restored him to liberty, when he immediately disseminated his opinions by his *Twofold Scripture Catechism*. He was again imprisoned and was to be put to death, but Cromwell banished him to Saint Mary's Castle, Scilly, and assigned him one hundred crowns annually. Here he remained three years, and after his release he continued to preach his opinions till after the Restoration, when he was fined one hundred pounds. Being unable to pay the fine, he was put into prison, where he remained till his death.

Bidwell, John (1819–1900), an American statesman, born in Chautauqua co., N. Y., and educated at Kingsville Academy, Ohio. He taught school for a time, but migrated to California in 1841 and later served in the Mexican War, attaining the rank of major. He was chosen to the legislature in 1849 and to Congress in 1864. He joined the Prohibition party at its organization, and became its nominee for the presidency in 1892.

Biela's Comet, *be′lahz kom′et,* discovered by Wilhelm von Biela, an Austrian officer, in 1826. Its periodic time was determined as six years and thirty-eight weeks. It returned in 1832, 1839, 1846 and 1852. On the latter two occasions it was in two parts, each having a distinct nucleus and tail. It has not since been seen as a comet; but in 1872, 1879 and 1885, when the earth passed through the comet's track, immense flights of meteors were seen, which were thought to be parts of the broken up and dispersed comet.

Bienville, *byaN veel′*, Jean Baptiste le Moyne, Sieur de (1680–1758), a French governor of Louisiana. He accompanied Iberville in his explorations of the Mississippi and settled at Biloxi in 1699. He explored the country and erected a fort 54 miles above the mouth of the river in 1700. In 1701 he became director of the colony and removed its capital to Mobile, but was discharged from his office in 1707. A new colony having been formed by Law's Mississippi company, Bienville was made its governor; he founded the city of New Orleans in 1718 and transferred the capital of Louisiana to the new town in 1723. He was removed from his post on Aug. 9, 1726, but in 1733 he was again made governor of Louisiana, with the rank of lieutenant general. He published a code which prohibited every religion except the Roman Catholic and banished Jews from the colony; this remained in force until Louisiana was purchased by the United States

Bierstadt, *beer′staht,* Albert (1830–1902), a German painter, born in Dusseldorf, Germany. He came to America when a child. Though he studied art in Europe, he chose California and Colorado as the field for his work. His favorite subjects contained mountain scenery, and he painted Laramie Peak, Lander's Peak, Mount Hood and other peaks of the Rockies and the Sierra Nevada with great success. He was a member of the National Academy and of the Saint Petersburg Academy of Fine Arts.

Big′amy. See Polygamy.

Big Beth′el, a small village in Virginia, situated on the peninsula between the James and York rivers. It is especially noted for its historical associations, being the place where an unsuccessful attempt was made by the Federals under General E. W. Pierce to attack and dislodge the Confederates who were stationed there under General Magruder in 1861.

Big Black River, a river in Mississippi which rises in Choctaw co. and enters the Mississippi River at Grand Gulf. It is nearly 250 miles long and is navigable for 50 miles to Bovina. The river flows through a rich country, which produces abundant crops of cotton. An important battle in Grant's Vicksburg campaign was fought upon its banks in 1863.

Bigelow, *big′e low,* John (1817–), an American author and journalist, born in Malden, N. Y. He graduated at Union College, was admitted to the bar, became with William Cullen Bryant part owner of the New York *Evening Post* in 1849 and managed the paper until 1861. In that year he was sent to Paris as consul and was United States minister there from 1865 to 1867. In 1867 he became a Democrat and was elected secretary of state of New York. He wrote biographies of Fremont, Bryant and Tilden and edited Franklin's autobiography and Tilden's speeches.

Bigelow, Poultney (1855–), an author, born in New York, the son of John Bigelow. After study in America, France and Germany, where he became a personal friend of the German emperor he graduated at Yale and at the Columbia Law School. He practiced only a few years, however, and then began to travel extensively. He sailed around the world, was shipwrecked on the coast of Japan, visited China, Africa, the East and West Indies and made canoe trips over Europe. He is a member of various American and English societies and has lectured on modern history and colonial administration at several American universities. His journalistic experience includes his work as editor of *Outing*, as London correspondent of *Harper's Weekly* and as Spanish-American War correspondent of the London *Times*. He has written *The Border Land of Czar and Kaiser*, investigation for which led to his expulsion from the Russian Empire; *A History of the German Struggle for Liberty*, and other works, which have generally been translated for European use.

Big′horn, the wild sheep of the Rocky Mountains, named from the size of its horns, which are three and a half feet long, the animal itself being of the same height at the shoulder. It is grayish brown, with a lighter face, a whitish patch on the rump and a dark line running along the spine. These animals go in herds of twenty or thirty, frequenting the craggiest and most inaccessible rocks, and are wild and untamable. The bighorn is also called the Rocky Mountain goat.

ROCKY MOUNTAIN GOAT

Bighorn River, a tributary of the Yellowstone, which rises in Wyoming, near Fremont's

Peak, and flows northeasterly, entering the Yellowstone near Blakely, Mont. The upper part of its course is noted for the grandeur of the mountain scenery. Its length is 400 miles, and it is navigable for a portion of this distance.

Bigno'nia, a genus of plants of many species, inhabitants of hot climates, usually climbing shrubs furnished with tendrils. The flowers are mostly in clusters at the ends of stems or in the axils of the leaves. As the beautiful corolla is trumpet-shaped, the name of *trumpet-flower* is commonly given to these plants. All the species are splendid plants when in blossom, and many of them are cultivated in gardens.

Big Rap'ids, MICH., county-seat of Mecosta co., on the Muskegon River and on the Pere Marquette and the Grand Rapids and Indiana railroads, 55 mi. n. of Grand Rapids. Big Rapids is an important lumber market, and it has foundries, machine shops, mills and furniture factories. Ferris Institute is located here. Population in 1905, 4852.

Big San'dy or **Sandy,** an affluent of the Ohio River, formed by the junction of the Tug Fork and the Louisa Fork. The Tug Fork rises in West Virginia and, flowing northwest, forms, with the Big Sandy, the southern boundary between West Virginia and Kentucky. The Levisa Fork rises in southwest Virginia and flows northwest into Kentucky, then northeast to join the Tug Fork. The river is navigable for small boats for about 100 miles.

Bilboes, *bil'boze*, an apparatus formerly used by the Spaniards for confining the feet of offenders on board ships. It consisted of a long bar of iron, with shackles sliding on it and with a lock at one end to keep them from getting off. This was one of the means of putting offenders "in irons."

Bile, a yellow, bitter liquid, separated from the blood by the cells of the liver and collected by the biliary ducts, which unite to form the hepatic duct. Bile passes from this into the duodenum, or by the cystic duct into the gall bladder, to be retained there till required for use. The flow of bile is continuous, but the amount varies during the twenty-four hours, being most abundant during digestion. The use of the bile is to aid in the digestion of fatty substances and to convert the chyme into chyle. It probably retards or prevents the decaying of food and may stimulate muscular action in the intestines. When bile is not secreted in due quantity from the blood, the unhealthy condition known as biliousness results.

Bill, a written or printed paper containing a statement of particulars; for instance, the itemized statement of accounts due to merchants, or a printed proclamation or advertisement. In legislation a bill is a draft of a proposed statute, submitted to a legislative assembly for approval, but not yet enacted and made law. When passed and approved it becomes an *act*. In court proceedings the term *bill* has several significations. It is a general term denoting various forms of beginning actions, a *bill of indictment* in a criminal case is a written accusation submitted to a grand jury.

Bil'leting, a mode of feeding and lodging soldiers when they are not in camp or barracks, by quartering them on the inhabitants of a town. The billeting of soldiers on private householders is prohibited in America, except in war time.

Bill'iard Balls are made usually from ivory. When a tusk reaches the manufacturer, it is examined very carefully for flaws. If found perfect, the tusk is measured into proper lengths, which are two and one-half or three inches, according to the size of the ball desired, and the blocks are then turned into balls. In order to save the corners, the turners cut a ring at each end and slowly deepen it until a rough ring drops off. Two rings are cut from each billiard ball block, after which it is almost round. It is then laid aside to dry for about six months. When it has been seasoned it is chiseled down smooth and exactly round. The ball is then polished by means of a machine and is treated to a rubbing, first with chalk and chamois skin, and finally with a plain, soft leather. Every particle of sawdust and shavings from the ivory is carefully saved. These are treated with chemicals, submitted to an enormous hydraulic pressure and molded into small articles so perfect that only an expert can tell them from solid ivory.

Billiards, a well known indoor game of skill, played on a rectangular table with ivory balls, which are driven against one another by means of an ash rod, or stick, called a *cue*, according to certain defined rules. Of the origin of billiards comparatively little is known—some considering that the game was invented by the French, and others that it was improved by them out of an ancient German diversion. Even the French themselves are doubtful on the point, some of their writers ascribing the game to the English. The strokes are all made with a cue gradually tapering to the end, which is tipped with leather and rubbed with chalk to prevent its slipping off the surface of the ball struck. The cue is taken in the right hand, generally between the fingers and the thumb, and not grasped in the palm. With the left hand the player makes a bridge, by resting the wrist and the tips of the arched fingers on the table and extending the thumb in such a way as to allow a passage in which the cue may slide. The shape of the table has varied from time to time. At first it was square, with a hole or pocket at each corner to receive the balls driven forward with a cue or mace; then it was lengthened and provided with two other pockets, and occasionally it has been made round, oval, triangular or octagonal, with or without pockets, according to the game required. It is covered with a fine green cloth and is surrounded by elastic india-rubber cushions. The table must be perfectly level and sufficiently firm to prevent vibration; the usual height of the surface from the floor is three feet.

The game as played in America has taken a distinctive character, in regard to both the tables and the manner in which it is played. The older American game was the four-ball game (now rarely played by experts), and it was at first played on a six-pocket table, after the English pattern, then on a four-pocket table and finally on a pocketless table. The points of the game number usually thirty-four, fifty or one hundred. A point is made whenever the cue ball in a single shot touches the two object balls. At the commencement of the game, the players *bank for lead*, which is done by both simultaneously driving their balls against the bottom cushion; the ball approaching and resting nearer to the head cushion on the rebound decides the winner, both as to choice of balls and as to order of play. The table has two spots, one near each end of the table. A red ball is placed on the spot at the foot of the table, and the ball of the player who lost the bank for lead is placed on the spot near the head of the table. The leader places his ball anywhere nearer the head of the table than his opponent's ball, and he tries to hit the red ball in such a way that his ball will strike, on its return, the ball of his opponent. If the leader succeeds, he has made a point, or *carom*, and he continues to play his ball at either of the others until he misses. Then his opponent plays his own ball, from where it lies, at either ball, under the same rules and conditions, until he misses a point. In this way the players alternate till the end of the game. If a ball jumps off the table after counting, the count is good and the ball must be spotted. When the cue ball is in contact with another, the balls are respotted and the player plays his own ball as at the commencement of the game.

The cushion carom game is a highly scientific play, it being necessary to a successful carom that the cue ball shall, in the course of the stroke, strike not only both object balls, but the cushion as well. The balk line is another limitation which has been imposed on the older game; in this form of the game a balk line eight, fourteen or eighteen inches from the rail is established, and the player is compelled to drive one or both object balls outside the line in order to count. In match games various handicaps are agreed upon, and strict rules concerning the manner of play are adopted. In social play, however, the rules are variously modified and fouls are rarely counted. The four-ball game is similar to the one described, except that there are two red balls besides the ones of the players.

In the English game the object of the player is to drive one or other of the balls into one or other of the pockets, or to cause the striker's ball to come into successive contact with two other balls. This game resembles the American game of pool more than billiards.

Bil'lings, Mont., the county-seat of Yellowstone co., 240 mi. s. e. of Helena, on the Yellowstone River and on the Northern Pacific and the Burlington railroads. The city exports considerable live stock, is one of the largest inland wool markets in the country and has a valuable trade and a large sugar beet factory. The Yellowstone Valley is provided with irrigation ditches, and it produces grain, fruits and vegetables. There are deposits of coal, marble and limestone in the vicinity. Population in 1900, 3221, and in 1910, 10,031.

Bil'lings, John Shaw (1838–), an American surgeon, born in Indiana. After studying at Miami University and the Ohio Medical College, he became assistant surgeon in the Federal army at the beginning of the Civil War and in 1876 was made surgeon in the regular army, with rank of major. Later he was medical adviser in Johns Hopkins Hospital and was lecturer on municipal hygiene in the Johns Hopkins University. Doctor Billings was the American member of the permanent committee of the International Congress of Hygiene, and for some time he was professor in the University of Pennsylvania. Among his works are *Principles of Ventilating and Heating and Their Practical Application, Bacteria of River*

Waters, Hygiene of the United States Army and *Report on Barracks and Hospitals.*

Billings, Josh. See Shaw, Henry Wheeler.

Bil'lingsgate, the principal fish market of London, on the left bank of the Thames, a little below London Bridge. From the character, real or supposed, of the Billingsgate fish dealers, the term *billingsgate* is applied to coarse and violent language.

Bill of Attain'der, a legislative enactment involving capital punishment, or the confiscation of property, of persons accused of high offenses. These bills were formerly commonly passed by the British Parliament, especially in cases of particularly prominent persons, as Thomas Cromwell, the earl of Strafford and William Laud. Such a bill considered matters belonging wholly to the judiciary and was passed in a most irregular manner, without allowing the accused a trial and upon evidence which was generally insufficient and often inadmissible. Bills of attainder were abolished in England in 1870 and are prohibited by the Constitution of the United States (Article I, Section 9). See Attainder.

Bill of Costs, in America an itemized list of the fixed costs of an action at law, which is filed by the successful party. After being verified and allowed by the clerk of the court, the amount is added to the judgment.

Bill of Exchange, a written order by one person to another, requiring the second to pay to a third person, or to his order or to bearer, at a certain or determinable time, a sum of money. Bills of exchange are *foreign* and *inland*, or *domestic*. A *foreign bill* is one drawn in one state or country upon a person in another. A *domestic bill* is one drawn and payable within one state. The following are common forms:

Inland:
$1000 Chicago, Ill., March 6, 1906.

Ninety days after date pay A. B. or order, one thousand dollars, with interest at the rate of of six per cent per annum, and charge to account of C. D.

To E. F., Springfield, Ill.
Accepted, E. F.

Foreign:
$1000 London, England, March 6, 1906.

At sight of this first of exchange (second and third unpaid) pay to A. B. or order, one thousand dollars, and charge to account of
C. D.

To E. F., Chicago, Ill.
Accepted, E. F.

Some states require the words "for value received" or their equivalent to be inserted in the bill. In the foreign bill the words "first of exchange" are inserted by reason of the fact that three duplicate bills are drawn, numbered, respectively, first, second and third, the first being given to the *payee*, that is, the one to whose order the bill is drawn, one being sent to the *drawee*, that is, the one who is to pay the money, and one being retained by the *drawer*, that is, the one who signs the bill. The drawee is under no obligation to pay a bill until he signifies his acceptance of it, which he may do in some states orally, but in most states only by signing his name across the bill. After accepting the bill the drawee is absolutely bound to pay it and is liable to suit. The drawer is liable for the amount of the bill, provided the drawee does not accept it. The bill can be transferred from the payee to any other person, provided the signature of each one to whom it is transferred is written upon its back. The persons whose names are thus signed become liable, in order, to all those who have signed subsequently, for the full amount of the bill, and thus they guarantee its payment. In actual business affairs to-day the indorsements are often made without the transference of the bill, but merely as an accommodation to the holder. See Negotiable Instruments; Notes.

Bill of Health, a certificate or instrument signed by consuls or other proper authorities, certifying the state of health at the time that ships sail from ports suspected of being subject to infectious diseases.

Bill of La'ding, a memorandum of goods shipped on board a vessel, signed by the master of the vessel, who thereby acknowledges the receipt of the goods and promises to deliver them in good condition at the place directed, subject to the ordinary accidents of a sea voyage. Similar bills are issued by other common carriers for the receipt of freight, but they are usually known as *way bills*. In both cases the bills are issued in duplicate or in sets of three, one being retained in the offices of the carrying company, one by the master of the conveyance and one by the person shipping the goods. They can be transferred by indorsement. See Freight.

Bill of Rights, a phrase used in a variety of meanings, to denote an enactment or agreement embodying a fundamental right or principle. Thus, a bill of rights has been inserted in the constitutions of most of the states of the

United States enumerating rights of the people which shall not be infringed and limitations upon the rights of the state. The same name has been given to the first twelve amendments to the United States Constitution, which were added to satisfy the objection of some of the states, that the Constitution did not cover specifically enough certain inalienable rights of the people. In English history the Bill of Rights is an act of Parliament passed in 1689, embodying the principles of political liberty now established in the English system of government. It is one of the three great instruments of the British constitution. Bills of rights have frequently been enacted in French history, especially after the Revolution of 1789.

Bill of Sale, a formal statement for the sale or transfer of personal property. It is often given to a creditor as security for borrowed money and empowers the receiver to sell the goods if the money is not repaid at the appointed time.

Bilox'i, Miss., a city in Harrison co., 60 mi. s. w. of Mobile, Ala., on the Louisville and Nashville railroad and on Biloxi Bay, which opens into the Gulf of Mexico. The place is a popular winter resort, on account of its extensive beach, well-paved streets and beautiful buildings. It is principally engaged in the canning of oysters, fish, fruits and vegetables, but it also has shipyards and various factories. In 1669 Iberville established a settlement across the bay from the present city and named it from the Biloxi indians; about 1712 a permanent settlement was made on the present site, which was the first within the limits of Mississippi. It was incorporated as a town in 1872 and as a city in 1896. Population in 1910, 7988.

Bimet'allism, that system of money in which coins of two metals (silver and gold) are legal tender to any amount; or in other words, the concurrent use of coins of two metals as a circulating medium, the ratio of value between the two being arbitrarily fixed by law. It is contended by advocates of the system that by fixing a legal ratio between the value of gold and silver, and using both as legal tender, fluctuations in the value of the metals are in part avoided, and the prices of commodities are therefore rendered more stable; also, that exchanges with countries using one or the other metal as a single standard are facilitated. Monometallists reply that bimetallism will not work, that the cheaper metal will always drive the dearer from use, whatever is the legal ratio (See GRESHAM'S LAW). Further, they assert, there is no reason to believe that if it did work it would cure the evil of fluctuations in prices, since the combined output of both metals might fluctuate as well as the output of one alone.

Bind'ing Twine, a twine made especially for use in self-binding harvesters (See REAPING MACHINES). The best varieties are made from manila hemp, obtained from the Philippine Islands. The hemp fiber is from two to six feet in length. This is switched and dusted, to comb out the valueless fiber, after which that to be made into twine is carded and straightened, then made into a narrow, flat ribbon of such size that when twisted it will produce a twine of the desired diameter. The ribbon is twisted by spindles, and from these the twine is wound on large bobbins holding 650 feet each. From the bobbins it is wound into balls, when it is ready for packing for shipment. These balls are so made that they unwind from the inside. Numerous attempts have been made to manufacture binding twine from straw and grass, but none has been successful. The large quantity of wheat and other grains raised in the United States makes the manufacture of binding twine an important industry.

Bind'weed, a genus of plants of the morning glory family, generally having creeping, twining stems and milky juice. The flowers are large and beautiful, but the plants of some species

BINDWEED

are extremely troublesome weeds, particularly the so-called *English bindweed.* This grows not only by its seeds, but also by slender creeping rootstocks, which make it particularly troublesome in grain fields and among hoed crops. If the plant is prevented from seeding and the land is cultivated in the late fall, the weeds may be reduced to control in a few seasons. Coal oil applied to the roots will kill them. The *hedge bindweed* lives in richer soil and has larger flowers a little later in the season. Sometimes the common morning glory runs wild and becomes a weed.

Bing'en, a town of Germany, in the grand duchy of Hesse, at the confluence of the Nahe with the Rhine. The district is noted for the culture of the vine, and the exquisite Rüdesheimer is produced in the neighborhood. There are manufactures of tobacco, glue, starch and leather. A tower, the Mausethurm, in the middle of the Rhine, erected probably about the year 1000, is celebrated in legend as the scene of the destruction by rats of the hard-hearted Bishop Hatto in 969. Restored in 1856, the tower now serves as a beacon, warning ships, by means of a flag, if the Binger Loch is clear. On the opposite bank of the Rhine is the Niederwald Monument, erected in commemoration of the victories of the war with France, 1870–1871. Population in 1900, 9670.

Bin'gham, John Arende (1815–1900), an American lawyer and legislator, born in Mercer, Pa. He was educated in Ohio and was elected to Congress from that state as a Republican, serving from 1855 to 1863. He took part in the trial of Lincoln's assassins and returned to Congress in 1865. During this period he prepared and introduced the Fourteenth Amendment and was one of the managers of the impeachment proceedings against Andrew Johnson. He was minister to Japan from 1873 to 1885.

Bing'hampton, N. Y., the county-seat of Broome co., 50 mi. e. of Elmira, at the junction of the Chenango and Susquehanna rivers and on the Lackawanna, the Delaware & Hudson and the Erie railroads. The city has a picturesque location and has sometimes been called the *Parlor City.* Some of the special attractions are Ross Park, Bennett Grove, the driving parks and the fair grounds. The prominent buildings include Central High School, Stone Opera House, the Y. M. C. A. and Y. W. C. A. buildings, several hospitals and children's homes and the courthouse, city hall and post office. The extensive manufactures of the city include cigars, wearing apparel, wagons, electrical apparatus, patent medicines, engines and furniture. It was settled in 1787. The original name of the town was Chenango Point, and the present name was given about 1800 in honor of William Bingham, who owned the land in the vicinity. It was incorporated as a city in 1867. The municipality built the waterworks the same year and now operates them. Population in 1910, 48,443.

Bin'ney, Horace (1780–1875), an American lawyer, born in Philadelphia, educated at Harvard University and admitted to the bar in 1800. He served in the Twenty-third Congress and was a conspicuous opponent of Jackson in his controversy over the United States Bank. He won note for his great argument before the United States Supreme Court over a question involving the legality of the bequests of Stephen Girard. During the Civil War he published important papers in support of Lincoln's suspension of the writ of *habeas corpus.*

Binoc'ular. See Microscope.

Bino'mial, in algebra, a quantity consisting of two terms or members, connected by the sign + or —. The *binomial theorem* is the celebrated method, devised by Sir Isaac Newton, for raising a binomial to any power, or for extracting any root of it, by forming a series of terms whose coefficients and exponents increase and diminish regularly, according to a certain law.

Biobio, *be'o be'o,* a Chilean river, which rises in the Andes, flows in a northwest direction for 180 miles and falls into the Pacific at the city of Concepcion. It is navigable for 100 miles.

Biog'raphy, that department of literature which treats of the lives of men and women. This species of writing has existed from very ancient times, and specimens of it in its simple forms are to be found in the Old Testament accounts of the patriarchs. The legends of the Greeks and Romans were for the most part but biographical accounts of the lives of their gods and heroes. Biography received no great development among the ancient peoples, and it was, even among the later Greeks and Romans, little more than an account of the happenings in the life of a man. Plutarch's *Parallel Lives,* written in the first century after Christ, is the most important of the early biographical works which have come down to us. Although during the Middle Ages many lives of saints and matryrs were written, biography in its modern sense may be considered to date from the seventeenth century, since which time individual biographies have multiplied enormously.

The ancient method of giving a mere chronicle of events has been greatly modified; selection of the more important events, emphasis on their relation to character and criticism, and even philosophical digressions, have made of biography a much less simple form of literature.

As examples of noteworthy biographies may be mentioned Boswell's *Life of Dr. Johnson*, the most famous of English biographies; Lockhart's *Scott*, Mrs. Gaskell's *Life of Charlotte Brontë*, Forster's *Dickens*, and *Tennyson*, by his son. The life of a person written by himself is called an *autobiography*, and as an example of this kind of writing Franklin's *Autobiography* may be mentioned. There have been many dictionaries of biography, among the best of which are Lippincott's *Pronouncing Biographical Dictionary*, the *English Dictionary of National Biography* and Appleton's *Cyclopedia of American Biography*.

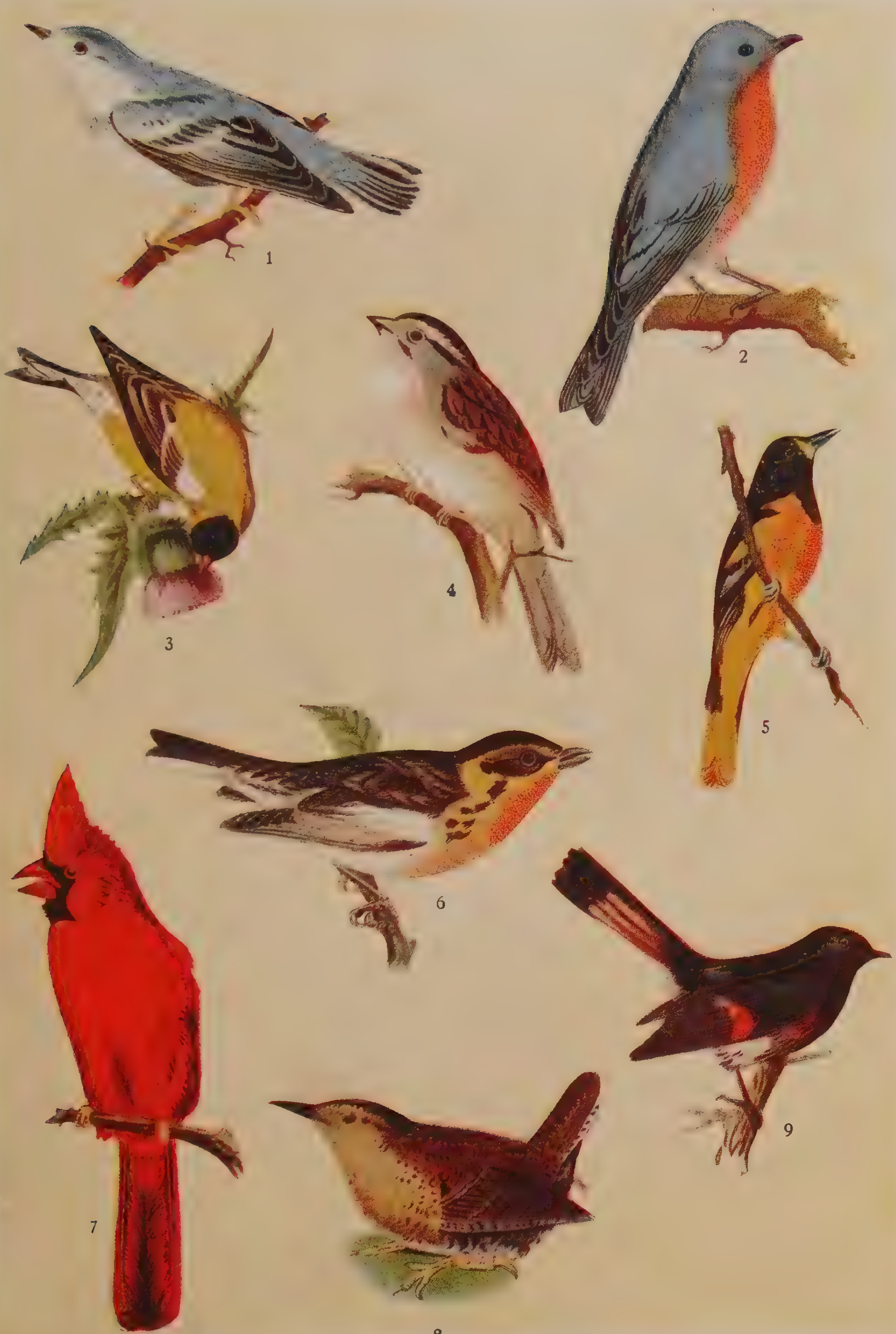
Biol'ogy, the study of living things and the phenomena of life. It deals with the whole organic world and tries to determine the laws which separate this field from the inorganic world. Beginning with the simpler forms of one-celled plants and animals, that can be studied only by the aid of a microscope, it includes the more complicated forms of both plants and animals and all the relations that exist between them. To show what life, present and future, really is, and what man's relation is to the entire world, are the purposes of biology. Biology, then, must include all such sciences as botany, zoology and ethnology, and is so extended and comprehensive that no one man can master the whole of it. The ordinary student interests himself solely in a small section of the field. The results of the work of many investigators are viewed from time to time by such men as Lamarck, Darwin and Haeckel, who generalize upon the knowledge the others have garnered and draw out the general principles of universal biology. Although in recent years a general advance has been made in the study of biology, yet many problems are still unsolved. In the public schools the name biology is applied to the study of the lower orders of plant and animal life and usually includes such work as compels the use of the microscope. See BOTANY; ZOÖLOGY.

Birch, *burch*, a genus of trees which comprises only the birches and alders, and which inhabits North America, Europe and northern Asia. The common European birch is extremely hardy, and only one or two other species of trees approach so near to the north pole. The wood of the birch, which is light in color and firm and tough in texture, is used for chairs, tables, bedsteads and the woodwork of furniture generally, also for fish-casks and hoops, as well as for many small articles. In France wooden shoes are made of it. The bark is whitish in color, smooth and shining, separable in thin sheets or layers. In some countries it is made into hats, shoes, boxes and other small articles. Fishing-nets and sails are steeped with birch bark to preserve them. In Russia the oil extracted from the birch is used in the preparation of Russia leather and imparts the well-known scent to it. The sap, which may be drawn from the tree during warm weather in the end of spring or beginning of summer, is so sweet that an agreeable wine can be made from it. The *dwarf birch*, a low shrub not more than two or three feet high at most, is a native of all the most northerly regions.

In the United States the *white* or *paper birch* is a fine tree, with valuable, close-grained wood. It was from the bark of this tree that indians made their birch canoes, and the thin, clean layers of the bark have been used instead of paper to write upon. The *yellow birch* is a large tree with yellowish bark. Both species are common in the north.

Bird'lime, a sticky substance used for entangling birds so that they can be easily caught. It is prepared from holly-bark, being extracted by boiling, also from the berries of the mistletoe. It is spread on twigs in places which the birds frequent.

Birds, warm-blooded animals, easily distinguished from the other vertebrates by their shape, by the feathers that cover their bodies and by their wings. Birds usually live in pairs, rearing their young in homes which they make themselves, though there are some remarkable exceptions to this rule (See NEST). All birds lay eggs from which young are hatched (See EGG). In the higher orders the young are naked when they break from the shell and must be cared for and fed by the parents, but in some of the lower species the little ones are covered with tiny hairs and in others covered with a complete suit of feathers before they hatch. In the latter case the young are able to take partial care of themselves very soon after they appear. The eggs vary in number from two to several dozen, seeming to be proportioned to the dangers the



COMMON AMERICAN SONGSTERS

1, Cerulean Warbler.
2, Bluebird.
3, American Goldfinch.
4, White-Throated Sparrow.
5, Baltimore Oriole.
6, Blackburnian Warbler.
7, Cardinal Bird.
8, House Wren.
9, Redstart.

young are to meet, but being practically the same number at every sitting of each species. The eggs which are hatched by heat are sometimes buried in rotting vegetation, or in the sand under the hot sun, but more frequently they are laid in artificial nests or in some natural receptacle, and are there brooded and kept warm by the body of the female until the chick matures and emerges This is usually a period of from two to three weeks.

Nothing is more wonderful than the flight of birds. Their wing power is extraordinary, but the speed with which they fly has doubtless been exaggerated. Their endurance is much more surprising. Some of the smallest and apparently feeblest of birds, that usually confine their flight to short dashes from bush to bush, may during their migrations cover in a single flight distances ranging from five hundred to two thousand miles (See MIGRATION OF ANIMALS). In order that the body, relatively so heavy, may be carried through the air, the muscles which move the wings must be very strong and have a strong frame for their attachment. The frame is furnished by the wide breast bone. But strong muscles alone would be insufficient were there not in the body air cavities, which sometimes extend even into the bones and feathers. The wings, which are the chief organs of flight, are modified fore limbs, corresponding to the arms of a human being. From the body of the wings grow strong feathers with heavy quills, making a broad surface with which the bird can beat the air. The heavy quills are covered both above and below with short feathers, which prevent the air from passing through and make it slide readily off. The tail does not help much in flight, but it is rather a rudder by which the bird steers itself and holds its body level. The feathers which cover the entire body are small and overlap, but they do not grow uniformly everywhere, being distributed in certain definite patches or areas.

The food of birds varies widely according to the species. No living bird has teeth, but the beak of each species is fitted to handle the food which it eats. No arrangement provides for the chewing of the food, so the bird's organs of digestion are peculiar. After the food is swallowed it finds lodgment first in the *crop*, a large sack at the bottom of the gullet. Here the food is soaked and softened for some time and then passed on to the *gizzard*, a kind of stomach, with exceedingly strong muscular walls and tough, hard, wrinkled lining. Here the food is ground fine by vigorous rubbing, sometimes aided by small pebbles and gravel eaten by the bird. Naturally the meat-eating birds have smaller gizzards, with thinner muscular coats, and in some species there is no gizzard at all. The quantity of food required by birds is enormous and in this necessity lies their chief value to the horticulturist.

Their sense of sight is keen, and in some species it is little less than marvelous. The eye is very much like that of a human being, but it has a third lid, which can be drawn at will so as partially to shut out the light. The nostrils open through the upper part of the beak, and in some birds the sense of smell is exceedingly keen. Although birds have no external ears, yet most of them are extremely sensitive to sound. The senses of taste and touch are dull, yet both are possessed by the bird. While not a large number of birds can be said to sing, yet songs are among the most pleasing and attractive of their characteristics. Some are able to utter only discordant, disagreeable notes, but others, like the crow, seem to have developed a language of their own, and not a few can be taught to speak words. Ordinarily, only the male birds can sing, and those which are most brilliant in plumage are the poorest singers. In general, the singing birds are small and lively, living principally upon grains and fruits. A remarkable trait of birds is their instinct for returning directly to their homes after having been away, as may be seen in the return of the homing pigeon and the return of many species from the winter migration to old homes in the north. The toes of a bird are fitted for clinging to twigs and branches, for scratching in the ground, for clasping and holding prey and, when bordered by a broad margin or connected by webs, for swimming. The muscles in the legs of perching birds are so arranged that when the bird sits, its toes are bent and cannot be opened until the bird rises again. This arrangement prevents it from falling from the twigs while asleep. Most young birds are fed upon insect food, and as they appear when insect pests are at the very worst, man is usually much benefited by their hearty appetites. The incredible number of insects eaten in a single day show how great a difference a few birds make. But the benefits conferred upon man by the birds are not confined solely to the extermination of insects. Many are excellent and even delicious food, and from the wild birds have come various domestic fowls which, because of their eggs and flesh, are among man's most valuable living possessions. The pleasure given by the beautiful colors, charming habits and sweet songs of the birds deserves more than a passing mention.

Many systems of classification have been offered and the one best known and still most generally in use, though not the latest, nor perhaps in all respects the best, is that which divides the class into the seven following groups:

I. *Raptores*, or birds of prey (See EAGLE; VULTURE; HAWK; OWL).

II. *Insessores*, or perching birds. This is the most numerous group and includes all of our singing birds.

III. *Scansores*, or climbers (See PARROT; WOODPECKER; TOUCAN).

IV. *Rasores*, or scratchers. In this group are included the domestic fowls (See FOWL; GROUSE; PHEASANT; PIGEON).

V. *Cursores*, or runners (See OSTRICH; EMU; CASSOWARY).

VI. *Grallatores*, or waders (See CRANE; HERON; SNIPE; SANDPIPER).

VII. *Natatores*, or swimmers, web-footed birds (See DUCK; GOOSE; GULLS).

These orders are represented in the accompanying color plate.

A very late and now generally accepted scheme divides all birds into two sub-classes, in the first of which is placed alone the earliest fossil form (See ARCHAEOPTERYX). The second sub-class is divided into three great sections, of which the first contains those birds unfitted for flying; the second, fossil forms having blunt teeth, and the third and greatest division of all, the birds of flight. This last group is separated into thirteen orders.

Recent years have seen the publication of a large number of very interesting books on the subject of birds, some of them dealing principally with their habits and manner of life, while others give simple descriptions of the birds in such a way that a person may name them on sight. Not a few of these books are beautifully illustrated with colored pictures, which show vividly the striking characteristics of the birds. Besides the local books which deal with the birds of the regions around large cities or in certain restricted localities, there are such general books as Frank M. Chapman's *Color Key to North American Birds* and *Birds of the Eastern United States*, which are excellent for beginners in bird study. Olive Thorne Miller's *Bird Ways, In Nesting Time* and *Our Home Pets*, Mabel Osgood Wright's *Bird Craft* and *Citizen Birds*, are books of a different type that are charming reading, whether one studies the birds in the field or not.

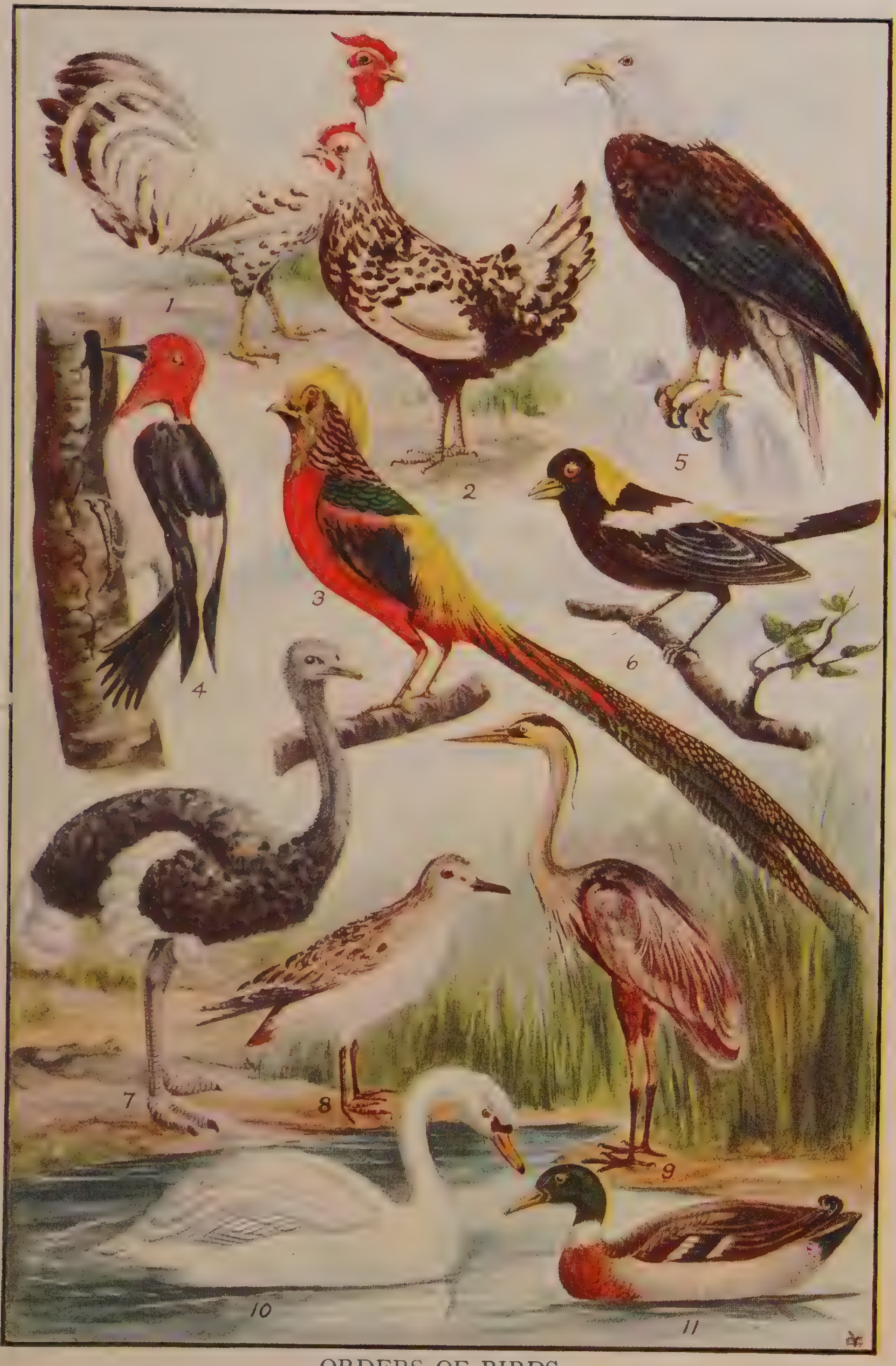
Bird's-eye Ma'ple or **Curled Maple,** the wood of the sugar-maple, when full of little knotty spots, somewhat resembling birds' eyes. When smoothed and polished the wood is very beautiful and is highly prized for cabinet work. Since curled maple is scarce, articles made of it are very expensive. See MAPLE.

Birds' Nests. See NEST.

Birds' Nests, EDIBLE, the nests of certain species of swifts found in the Indian seas. The nest has the shape of a common swallow's nest, is found in caves, particularly on the seashore, and has the appearance of fibrous, imperfectly made isinglass. When procured before the eggs are laid, the nests are of a waxy whiteness and are then esteemed most valuable. They appear to be composed of a mucilaginous substance secreted by special glands. The Chinese use them in making soups.

Birds of Par'adise, the familiar name for a family of birds noted everywhere for the splendor of their plumage. About forty species live in Australia, New Guinea and the other islands of the Pacific. They live almost entirely in the tree tops, eating seeds, fruits and insects and building their rather flimsy nests. In all species the plumage of the male especially is brilliant and velvety, but it is not alone in brilliancy of color that the birds of paradise are remarkable. The males have wonderfully long and graceful plumes, which in some species grow from the shoulders, in others from the tail or from the head. In one species the shoulder tufts are so long and fine that they fall far below the body, and even below the tail, in a showery mass of brilliantly colored, delicate, thread-like feathers. The plumes of the tail in one species are long, slender quills, which on the very tip bear a small rounded vane. It is difficult to describe the varieties in feathers or the tints and shades

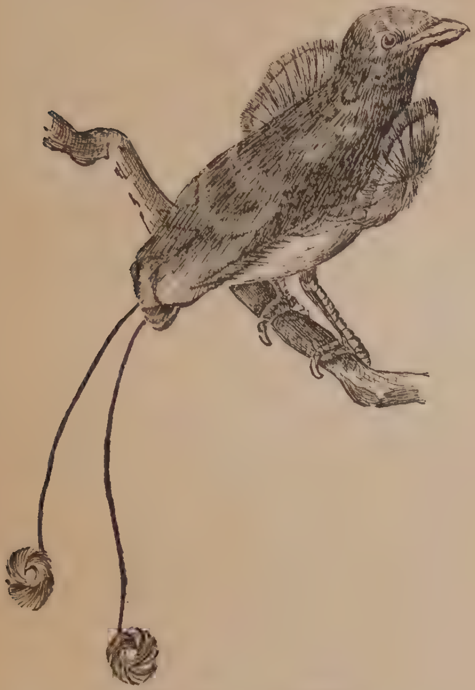
RED BIRD OF PARADISE



ORDERS OF BIRDS

Scratchers 1 and 2, Domestic Fowls. 3, Golden Pheasant.	Climbers 4, Woodpecker. Birds of Prey 5. Eagle.	Perchers 6, Bobolink. Runners 7, Ostrich.	Waders 8, Sandpiper. 9, Heron.	Swimmers 10, Swan. 11, Domestic Duck.

of color to be found, even on a single bird, and it is quite impossible to give any idea of the varied and brilliant family. The smallest are about the size of the sparrow, and the largest are nearly as big as a crow. The males often gather together in some tree and give peculiar dances, fluttering their gorgeous plumes to attract their mates. It is at this time, when the birds are excited by their performances, that the native hunters kill them for the market.



KING BIRD OF PARADISE

Bir'mingham, Ala., county-seat of Jefferson co., 97 mi. n. w. of Montgomery, on the Central of Georgia, the Louisville & Nashville, the Southern and other railroads. It lies in a region rich in iron, coal and limestone. The chief industry is the manufacture of iron and steel in various forms. There are also cotton mills, packing houses, cottonseed-oil mills and extensive iron and coal mining and lumber interests. The city was laid out in 1871. It did not progress rapidly until 1880, when the natural resources of the surrounding country began to be developed. It is now one of the most prosperous cities of the South. It has beautiful parks, several fine public buildings and various charitable and educational institutions. The city has grown very rapidly. Population in 1910, 132,685.

Birmingham, a large manufacturing city of England, in the county of Warwick, 103 mi. n. w. of London and 78 mi. s. e. of Liverpool. The principal buildings are a grammar school of Edward VI, Saint Philip's and Christ's churches, Queen's College, the town hall, a theater and an art gallery. The industries are very important and employ one hundred thousand people. It is one of the chief centers of the world for the manufacture of brass, iron and hardware goods. Other manufactures are gold and silver plated, bronze and japanned wares, papier-maché goods, jewelry, buttons, glass and tools. Birmingham returns seven members to Parliament. Population in 1901, 522,204.

Birnam, *bur'nam,* a hill in Perthshire, Scotland, 12 mi. w. n. w. of Dunsinane. It is 1324 feet high and was once covered by the royal forest made famous by Shakespeare in *Macbeth.*

Birney, *bur'ny,* James Gillespie (1792–1857), an American politician and reformer, born in Danville, Ky. He graduated at Princeton in 1810, studied law and began practice in Danville in 1814. He was soon elected to the legislature and, having removed to Alabama, served in the legislature of that state. He gradually turned his attention to the study of the slavery question and became the leader of the conservative wing of the Abolitionists. In 1833 he returned to Danville, freed his own slaves and from that time forward devoted himself to the cause of gradual emancipation He organized the Kentucky Anti-slavery Society in 1835, and in the following year he moved to Cincinnati and issued the first number of an anti-slavery paper. During the next few years he often suffered from the violence of mobs, but he gradually gained in public esteem in the North. In 1840 and again in 1844 he was the candidate of the Liberty party for the presidency, but received comparatively few votes. The last twelve years of his life he was an invalid, but he continued to write for the press.

Birs Nim'rud, a famous mound in Babylonia, on the west side of the Euphrates, 6 mi. s. w. of Hillah, generally identified as the remains of the Tower of Babel.

Bis'cay, Bay of, that part of the Atlantic which lies between the projecting coasts of France and Spain, extending from the French island of Ushant to Cape Ortegal. It receives the rivers Loire, Charente, Adour and Gironde. The principal ports on the bay are Nantes, Bordeaux, Bayonne, San Sebastian and Gijon.

The tides of the Bay of Biscay are among the highest known, and navigation is very difficult.

Biscuit, *bis'kit,* a kind of hard, dry bread, which is not liable to spoil when kept. Biscuits are either fermented or unfermented, the kinds in ordinary use being generally fermented, while the unfermented biscuit is much used at sea, and hence is called *sea-biscuit.* More than a hundred different sorts of biscuit are manufactured, and, owing to the immense demand, manual labor has long since been superseded in the larger works by machinery. In making sea-biscuit the flour is mixed with water, converted into dough by a revolving shaft armed with knives, kneaded with rollers, cut, stamped, conveyed on a framework drawn by chains through an oven open at both ends, and thence passed to a drying room—all without being touched by hand. Two thousand pounds of biscuits can thus be turned out of a single oven in a day of ten hours. In many fancy biscuits the process is of course more elaborate, but even these are now made entirely by machinery. Sea-biscuit should continue sound for eighteen months or two years. *Meat biscuits* are made of flour mixed with the soluble elements of meat. The popular American name for most varieties of biscuits is *crackers.* See BREAD.

Biscuit, in pottery, a term applied to porcelain and other earthenware, after the first firing and before glazing. At this stage the ware is very porous. See POTTERY.

Bishop, *bish'up,* the title of an overseer or superintendent over a number of local churches, which constitute his diocese. The Anglican, Roman Catholic, Greek and some other eastern churches consider the office of bishop to have descended in an unbroken line from the twelve apostles. Most Protestant denominations, however, do not accept this order of succession. The Methodist Episcopal Church recognizes the authority of a bishop, but not an ecclesiastical supremacy. In this Church the office is elective, and after reaching a certain age the bishops are placed upon the retired list. The duties of the bishop vary with different denominations. In general, the bishop has oversight over the clergy and various church interests within his diocese. He may call conventions of the clergy, at which he presides, appoint clergymen to churches and for cause may remove them from their positions.

Bismarck, *biz'mahrk,* N. D., the capital of the state and the county-seat of Burleigh co., 194 mi. w. of Fargo, on the Missouri River and on the Northern Pacific and the Minneapolis, Saint Paul & Sault Sainte Marie railroads. The state capitol, which cost half a million dollars, is the most prominent building, and another is the state penitentiary, located about a mile from the city. The city is an important base of supplies for Indian agencies and military forts. There is an extensive trade in coal, grain and general supplies. It is the see of the Catholic diocese of Bismarck. Bismarck was settled about 1873, was made the capital of Dakota Territory ten years later and became the capital of the state in 1889. Population in 1910, 5443.

Bismarck Archipelago, *ahr'ki pel'a go,* the name given by the Germans to New Britain, New Ireland and other islands in the Pacific, about 56 mi. e. of New Guinea. The area is about 18,200 square miles. The chief articles of export are copper and trepang. Population, about 200,000.

Bismarck-Schönhausen, *bees'mahrk shon'-how zen,* KARL OTTO EDUARD LEOPOLD VON, Prince (1815–1898), chancellor of the German Empire and one of the greatest statesmen of the nineteenth century. He was born at Schönhausen, of a noble family, studied at Göttingen and Berlin and entered the army. After a brief interval devoted to his estates and to the office of inspector of dikes, he became in 1846 a member of the provincial diet of Saxony, and in 1847 of the Prussian diet. In 1851 he was appointed

PRINCE VON BISMARCK

representative of Prussia in the diet of the German Federation at Frankfort, where with brief interruptions he remained till 1859, exhibiting the highest ability in his efforts to checkmate Austria and place Prussia at the head of the German states. From 1859 to 1862 he was ambassador to Saint Petersburg, and in the latter year, after an embassy to Paris of five months' duration, he was appointed minister of foreign affairs and president of the Prussian cabinet. The Lower House persistently refusing to pass the bill for the reorganization of the army, Bismarck at once dissolved the diet, closing it for four successive sessions until the work of reorganization was complete. When popular feeling had reached its most strained point, the Schleswig-Holstein question acted as a diversion, and Bismarck, by the skillful manner in which he added the duchies to Prussian territory, checkmated Austria and excluded her from the new German confederation, became the most popular man in Germany (See PRUSSIA; SCHLESWIG-HOLSTEIN; SEVEN WEEKS' WAR).

Prussia now held the chief place in Germany, and as a result a struggle between Germany and France appeared to be sooner or later inevitable. Bismarck, having made full preparations, brought matters to a head on the question of the Hohenzollern candidature for the Spanish throne (See FRANCO-GERMAN WAR). After the successful issue of the war, Bismarck became chancellor and prince of the new German Empire. He formed with Austria and Italy the Triple Alliance, not with the intention of entering upon further war, but with the purpose of making Prussia so strong that other powers would not dare attack her. Subsequently he alienated the Roman Catholic party by his opposition to the doctrine of the pope's infallibility, and was for a long time involved in a conflict with the Church. He held his position of chancellor until in March, 1890, he disagreed with the emperor and tendered his resignation. In March, 1895, on the celebration of his eightieth birthday, the emperor visited him.

Bismuth, *biz'muth,* a metal of a yellowish or reddish-white color and of a plate-like texture. It is somewhat harder than lead and cannot be worked with a hammer when cold, being so brittle as to break easily into powder. Its internal face or fracture exhibits large shining plates variously disposed. It fuses at 476° F. and expands considerably as it hardens. It is often found in a native state, crystallized in eight-sided forms, or in the form of thin plates in the ores of other metals, particularly cobalt. Bismuth is used in making pewter and printers' types and in various other metallic mixtures. Eight parts of bismuth, five of lead and three of tin constitute the fusible metal sometimes called Newton's, which melts at 202° F., and may be fused over a candle in a piece of stiff paper without burning the paper. Bismuth forms the basis of a sympathetic ink. The nitrate of bismuth is used as a medicine, while the oxychloride is used as a paint and as a cosmetic, under the name of *pearl-white* or *pearl-powder.*

Bi'son, the name applied to two species of ox. One of these, the *European bison* or *aurochs,* is now nearly extinct, being found only in the forests of Lithuania and the Caucasus. The aurochs is a fierce animal, dark brown in color, about six feet in height and having large tapering horns. The other species, or *American bison,* improperly termed buffalo, was found formerly over the whole western half of North America in enormous herds, but has almost become extinct in the wild state. A few herds are preserved by individuals, a few others are in zoölogical gardens and a herd is kept in the Yellowstone National Park. The destruction of the American bison is one of the worst of the many cruel and wanton acts of hunters, for countless hundreds of animals were killed, and their hides, flesh and bones were left to decay where they fell. The two species of bison resemble each other, the American bison, however, being for the most part smaller. The bison is remarkable for the great hump or projection over its fore shoulders, at which point the adult male is almost six feet in height, and for the long, shaggy, rust-colored hair over the head, neck and fore part of the body. In summer, from the shoulders backward the surface is covered with a very short fine hair, smooth and soft as velvet. The tail is short and tufted at the end. Its flesh is rather coarser grained than that of the domestic ox, but it was considered by hunters and travelers as superior in tenderness and flavor. The skins, dressed in the indian fashion, with the hair on, made admirable defenses against the cold, but buffalo robes have become almost a thing of the past.

Bissagos, *bis sah'goz,* or **Biju'ga Islands,** a group of small volcanic islands near the mouth of the Rio Grande River, off the west coast of Africa. The islands have several good harbors and are densely populated with negroes, who are in an uncivilized state. The inhabitants cultivate maize and tropical fruit and raise cattle.

Orange is the largest island, and Bulama, on the island of the same name, is the chief town. The islands are inclosed by a reef, and with few exceptions they are densely wooded.

Bis'sell, Wilson Shannon (1847–1903), an American statesman, born in Rome, N. Y. He graduated at Yale College in 1869, began practice at Buffalo and was Grover Cleveland's law partner when the latter became mayor of Buffalo. Bissell became well known as a corporation lawyer. He was made postmaster general in Cleveland's cabinet in 1893, but resigned in 1895 and became chancellor of the University of Buffalo in 1902.

Bistre, *bis'tur,* a warm brown pigment, a burned oil extracted from the soot of wood, especially beech. It furnishes a fine transparent wash, but it is chiefly employed in the same fashion as sepia and India ink in painting.

Bit. See Bridle and Bit; Boring Machine.

Bithynia, *bi thin'y ah,* an ancient country of Asia Minor, bounded by the Propontis, Bosporus and Euxine on the north, Mysia on the west, Phrygia and Galatia on the south and Paphlagonia on the east. It was settled by Thracians and was conquered by King Croesus of Lydia. Later it fell to the Persians, and afterward it was subdued by Alexander the Great. The Bithynian kingdom was founded by Nicomedes I about 278 B. C. and remained independent until 74 B. C., when Nicomedes III ceded it to the Romans, who placed Pliny the Younger as ruler over it. Its chief cities were Chalcedon, Heraclea, Nicaea, Nicomedia and Brusa. In 1298 the Turks broke into the country and conquered it. Brusa was for some time thereafter a Turkish capital.

Bit'ter-ash. See Quassia.

Bit'tern, the name of several wading birds of the heron family. The common bittern of the United States is a dull yellowish brown, with spots and bars of black or dark brown. It has a short tail and long and loose breast feathers. It is remarkable for its curious booming or bellowing cry. It has a great variety of common names, such as mire-drum, fly-up-the-creek and stake driver. If wounded the bird fights vigorously. Although it is a harmless and night-hunting bird that lives upon the small animals of the swamps, people all seem prejudiced against it.

AMERICAN BITTERN

Bittern, the syrupy residue from evaporated sea water, after the common salt has been taken out of it. It is used in the preparation of Epsom salt (sulphate of magnesia), of Glauber's salt (sulphate of soda), and contains also chloride of magnesium, iodine and bromine

Bit'ternut, the swamp hickory, a tree of North America which produces small and somewhat egg-shaped fruits, with a thin, fleshy rind; the kernel is bitter and unpleasant. See Hickory.

Bit'terroot, a plant of Canada and northwestern United States, so called from its edible root, which is esteemed as a delicacy by whites as well as indians. From its tobacco-like odor while cooking, it is called *tobacco root.* From the root, which is long, fleshy and tapering, grow clusters of juicy green leaves, with a fleshy stalk bearing a handsome solitary rose-colored flower, rising in the center and remaining open only in sunshine. Bitterroot is the state flower of Montana.

Bitter Spar, the crystallized form of dolomite or magnesian limestone, so named by the Germans because the magnesia gives it a bitter taste. See Dolomite.

Bitu'men, a mineral substance composed principally of hydrogen and carbon, and appearing in a variety of forms, which pass into one another and are known by different names, from *naphtha,* the most fluid, to *petroleum* and *mineral tar,* which are less so, thence to *maltha* or *mineral pitch,* which is more or less cohesive, and lastly to *asphalt* and *elastic bitumen,* which are solid It burns like pitch, with much smoke and flame. Bitumen is found in the earth, occurring principally in the secondary, tertiary and alluvial formations. It is a very widely spread mineral, and it is now largely employed in various ways. As the binding substance in mastics and cements it is used for making roofs, arches, walls and cellar floors water-tight, and for street and other pavements. It is also used, in some of its forms, for fuel and for illuminating purposes. The bricks of which the walls of Babylon were built are said to have been cemented with bitumen, which gave them unusual solidity. See Asphalt; Coal, subhead *Bituminous Coal.*

Bitu'minous Coal. See Coal.

Bituminous Shale or **Schist,** *shist,* a clay shale impregnated with bitumen and very common in the coal measures. Much of this rock contains so much coal and bitumen that it is used for fuel. See Coal.

Bizet, *be za',* Alexandre César Léopold (1838–1875), a French composer, chiefly known for his light opera, *Carmen,* considered one of the best of its kind extant. He showed remarkable musical genius at an early age, and while studying in Italy received many prizes for compositions. Returning to France, he adopted the methods of the extreme romantic school, but his work was not warmly received and as a last resort he wrote *Carmen.* This was a failure at first, but it soon won recognition, though Bizet died before its success was assured.

Björnson, *byörn'son,* Björnstjerne (1832–1910), a Norwegian novelist, poet and dramatist. He was educated at the University of Christiania and shortly after leaving the university became known as a contributor of articles and stories to newspapers, and as a dramatic critic. From 1857 to 1859 he was manager of the Bergen theater, and he produced during that time his novels *Synnove Solbakken* and *Arne,* and his first drama, *Between the Battles.* He was editor or associate editor of several periodicals, traveled and lectured in the United States and spent considerable time abroad. In spite of this last fact, however, he was intensely national, and he was the leader of the Norwegians in many popular movements. Among his tales and novels, besides those mentioned above, are *The Fishermaiden, A Happy Boy, The Bridal March, Dust* and *In God's Way;* while among his dramas are *The Newly Married Couple, Mary Stuart in Scotland, A Bankruptcy, The King* and *A Glove.*

Black, Jeremiah Sullivan (1810–1883), an American jurist and statesman, born in Pennsylvania. After receiving a good education, he studied law, was admitted to the bar in 1831 and became prosecuting attorney of his county. In 1842 he was raised to the bench and became justice of the state supreme court in 1851. In 1857 he was called to the cabinet by President Buchanan as attorney general and succeeded General Cass as secretary of state in December, 1860. In this post he labored earnestly for the cause of the Union. He became reporter of the United States Supreme Court for a short time, after which he returned to the practice of his profession in York, Pa., and was one of the counsel for President Johnson in his impeachment trial. He was a member of the Pennsylvania constitutional convention in 1873 and was a conspicuous advocate of Tilden's claims before the electoral commission of 1876.

Black, William (1841–1898), a Scottish novelist, born in Glasgow. His first novel, *Love or Marriage,* was moderately successful, but *In Silk Attire, Kilmeny* and, especially, *A Daughter of Heth,* gained him an increasingly wide circle of readers. Among his later works are *The Strange Adventures of a Phaeton, A Princess of Thule, Green Pastures and Piccadilly, Macleod of Dare, White Wings, Judith Shakespeare, Madcap Violet* and *In Far Lochaber.* Black is decidedly at his best when dealing with the Scotch Highlands, where most of his scenes are laid.

Black'berry, a thorny shrub bearing a fruit consisting of several small drupes or berries, arranged around a receptacle. The blackberry is cultivated in most fruit-growing localities. It also grows wild in cool climates, and in the United States it is found as far north as Canada. It is a choice small fruit.

Black'bird, a common bird of which about twelve species are known in the United States. The males are usually wholly or in part black, but the females are brownish, commonplace birds. The *red-winged blackbird* is a handsome inhabitant of the marshes that wears a bright scarlet epaulette on each shoulder. In the West Central states is a handsome species, whose head and neck are a bright yellow or orange. In Europe the word blackbird is applied to the merle, a well known thrush which has a rich, mellow and flute-like song. See Cowbird; Crow Blackbird; Grackle.

RED-WINGED BLACKBIRD

Black'burn, an important manufacturing city of England, situated 21 mi. n. w. of Manchester. The important buildings include the town hall, municipal offices, exchange, county court, county police station, an opera house, a library and a museum, all of which are constructed on the most approved modern plans. The city has two parks and is an important railway center. A grammar school located here was founded by Queen Elizabeth in 1557. Next to Manchester, Blackburn is the most important cotton manufacturing city of England. It contains over 140 factories, and the annual output of textiles is valued at about $25,000,000. The other important industries are the manufacture of machinery and steam engines. Population in 1901, 127,527.

Blackburn, Joseph Clay Styles (1838–), an American statesman, born in Kentucky. He practiced law in Chicago for several years, but entered the Confederate army in 1861 and served through the Civil War. He was elected to the Kentucky legislature in 1871, and in 1875 he entered Congress as a Democrat, being reëlected up to 1882. In March, 1885, he became United States senator and was reëlected in 1891 and in 1901. He was a leader in the free silver movement.

Black'cap, a name given to several birds of Europe and America that are marked by black heads. The European blackcap is a small warbler, famed for the sweetness of its song. In America the Wilson warbler is locally called the blackcap, and in other places the chickadee is given the same name.

Black Death. See Plague.

Black'fish or **Tautog,** *taw tog'*, a fish caught on the American coast, especially in the vicinity of Long Island, whence large supplies are obtained for the New York market. Its back and sides are of a bluish or crow black; the under parts, especially in the males, are white. It is plump in appearance, and much esteemed for the table, varying in size from 2 to 12 pounds.

Black'foot, a tribe of indians once living in the United States and Canada, from the Yellowstone to Hudson Bay. About 5000 are now in existence, those of the United States being on reservations in Montana. This name was given by the whites, who first saw them with leggins blackened by the burned grass of the prairies. They live on a reservation in Montana.

Black Forest, a chain of European mountains in the southwestern part of Germany, in Baden and Württemburg, running almost parallel with the Rhine for about 85 miles. The Danube, Neckar, Kinzig and other streams rise in the Black Forest, which is rather a chain of elevated plains than of isolated peaks. The highest summit is Feldberg, 4900 feet. The principal mineral is iron, and there are numerous mineral springs. The forests are extensive, chiefly of pines and similar species, and yield much timber. The manufacture of wooden clocks, toys and musical instruments is the most important industry, employing about 40,000 persons. The inhabitants of the forest are quaint and simple in their habits, and the whole district preserves its old legendary associations.

Black Friday. See Gould, Jay.

Black Gum, an American tree yielding a tough, close-grained, useful wood. The leaves are handsome and turn a bright crimson in autumn. The fruit is blue-black in color, whence it seems to get its name of black, but there is no gum about the tree. It is called sour gum, pepperidge and tupelo, and has been introduced into Europe as an ornamental tree.

Black Hawk (1767–1838), a chief of the Sac and Fox tribes of indians, who was born in Kaskaskia, Ill. He earned his position as head chief of the allied tribes by his successful expeditions against the Osage and Cherokee tribes. In 1804 the Sacs and Foxes agreed to cede to the United States lands extending about 800 miles along the Mississippi River. This contract Black Hawk repudiated, claiming that the chiefs had been made drunk before they signed the documents. During the War of 1812 Black Hawk, tempted by British agents, joined them with about 500 warriors, but soon retired from British service. In 1823 most of the Sacs and Foxes, under the leadership of Keokuk, removed to their reservation beyond the Mississippi River; but Black Hawk, with part of the tribe, refused to emigrate and fought with the whites what is known as the Black Hawk War. After several encounters, the indians were defeated, and Black Hawk and his two sons became captives. The three were confined in Fortress Monroe until 1833.

Black Hills, a somewhat mountainous region located in the southwestern part of South Dakota and extending into Wyoming. The Black Hills are known as one of the best mining regions in the United States. The territory was purchased of the indians in 1876, and mining operations were begun the year following. Gold, silver, copper, lead, iron and a number of valuable building stones are obtained in the region. The annual output of gold is about $4,000,000 and of silver about $3,000,000. See SOUTH DAKOTA.

Black Hole of Calcut'ta, a small chamber, 20 feet square, in the old fort of Calcutta, India, in which, after the capture by Surajah Dowlah, the whole English garrison of 146 men was confined during the night of June 20, 1756. Only twenty-three survived the terrible experience.

Black'ie, JOHN STUART (1809–1895), a Scotch writer and educator, educated at the universities of Aberdeen and Edinburgh and in Germany. He became professor of Latin literature in Aberdeen and later professor of Greek at Edinburgh. He was widely known for his knowledge of the ancient classics, but particularly for his strong personality and influence in establishing important reforms in the universities of Scotland. He was the author of many works, but is best known in America by his *Self-Culture*.

Black'ing, a dressing for boots and shoes, usually containing for its principal ingredients oil, vinegar, ivory or bone black, sugar or molasses, strong sulphuric acid and sometimes rubber gum and gum-arabic. It is used either as liquid or in the form of paste, the only difference being that in making the paste a portion of the vinegar is withheld and more lamp black or ivory black is added.

Black Lead. See GRAPHITE.

Black'mail, a certain amount of money, corn, cattle or the like, anciently paid, in the north of England and in Scotland, to certain men who were allied to robbers, for protection by them from pillage. The modern use of the term applies to money extorted from persons under threat of exposure for an alleged offense.

Black'more, RICHARD DODDRIDGE (1825–1900), an English novelist, born at Longworth, Berkshire, and educated at Tiverton school and Exeter College, Oxford. In 1852 he was called to the bar at the Middle Temple, and he practiced law until his health failed. While living on a fruit farm a short distance from London, he began his literary career by the publication of a volume of poems. Blackmore wrote a number of novels, among which are *Cradock, The Maid of Sker, Alice Lorraine, Cripps the Carrier, Erema, Mary Anerley* and *Kit and Kitty*. His fame rests almost entirely on *Lorna Doone*, a story of Exmoor and the neighboring district. This work, with its stirring plot and beautiful descriptions, is written with a convincingness which makes it hard for a reader to believe that it is but fiction.

Black Mountains, a ridge of mountains located in North Carolina and the northern part of Georgia and Alabama, and extending approximately east and west. The Black Mountains form the culmination of the Appalachian system and contain the highest peaks east of the Rocky Mountains. The most noted of these are Mount Mitchell, 6710 feet, Clingman's Peak and Guyot's Peak, both of which exceed 6500 feet in altitude. See APPALACHIANS; BLUE RIDGE.

Black Prince, THE. See EDWARD, THE BLACK PRINCE.

Black Sea (ancient Pontus Euxinus), a sea situated between Europe and Asia and mainly bounded by the Russian and Turkish dominions, being connected with the Mediterranean by the Bosporus, Sea of Marmora and Dardanelles, and by the Straits of Kertsch with the Sea of Azov, which is, in fact, only a bay of the Black Sea. It has a length of 750 miles, a greatest width of 380 miles and a greatest depth of 7000 feet. The water is not so clear as that of the Mediterranean, and it is less salt, on account of the many large rivers flowing into it, among which are the Danube, Dniester, Dnieper and Don. The tempests on it are very violent, as the land which confines its agitated waters gives to them a kind of whirling motion, and in the winter it is scarcely navigable. During January and February the shores from Odessa to the Crimea are ice-bound. The Black Sea contains few islands and those of small extent. The most important ports are Odessa, Kherson, Sebastopol, Batum, Trebizond, Sinope and Varna. The sea is of great commercial importance to Russia, as it furnishes an outlet for the agricultural region of the south.

Black Snake or **Blue Racer,** a common snake in North America, reaching a length of five or six feet, and exceedingly agile and swift. It has no poisonous fangs and therefore is comparatively harmless, though it possesses power of destroying its prey by the contraction of its folds. It is a deadly enemy of the rattlesnake, in destroying which it shows great skill. The blacksnake is usually bluish above and slate color beneath, though in the South it becomes an olive-green. Birds' eggs and small animals, like mice, frogs and birds, comprise its food.

Black'stone, MASS., a town in Worcester co., about 2 mi. n. w. of Woonsocket, R. I., on the Blackstone River and on the New York, New Haven & Hartford railroad. It supports a public library and has manufactures of cotton, woolen, rubber and other goods. The place was settled about 1700, separated from Mendon in 1845 and named in honor of William Blackstone, the first settler on the site of Boston. Population in 1910, 5648.

Blackstone, SIR WILLIAM (1723–1780), an eminent English jurist. He was admitted to the bar in 1746, but soon gave up the law and established a course of lectures at Oxford on the law and constitution of England. His lectures attracted much attention, and he was soon after appointed to the chair for the study of the common law of the country. After resigning his professorship, he published his lectures as *Commentaries on the Laws of England.* The merits of this book made it for a long time the principal text-book of English law, and all subsequent American and British commentaries have been based on it.

Black′well, ELIZABETH (1821–), the first woman who ever obtained a medical diploma in the United States. She was born in England and in 1831 settled with her parents in America, where she was engaged in teaching for several years. After numerous difficulties she was admitted to the College of Geneva, N. Y., and graduated in medicine in 1849. She afterward studied in Paris, and on her return to America commenced practice in New York, where she afterwards chiefly resided. In 1854, with her sister Emily, she opened a hospital for women and children in New York.

Blackwell's Island, a narrow island in the East River, a part of New York City. It is between Manhattan Island and Long Island and measures about 1½ miles long and ⅛ mile wide. On this island are the penal institutions and hospitals of New York City.

Blackwood or **Indian Rose′wood,** a tree of Hindustan, the timber of which is highly valued and much used in the manufacture of fine furniture. The Australian blackwood is an acacia.

Black′wood, WILLIAM (1776–1834), an Edinburgh publisher. He began as a bookseller in 1804 and soon became a publisher. The first number of *Blackwood's Magazine* appeared in April, 1817, and soon gained the popularity which it has kept until the present. Scott, Lockhart and De Quincey were among its early contributors. After the death of William Blackwood, the business, which had developed into a large publishing concern, was carried on by his sons.

Blad′der. See KIDNEYS.

Blad′dernut, a name of shrubs or small trees, natives of Europe, Asia and North America, the fruits of which consist of an inflated bladdery capsule, containing the seeds.

Blad′derwort, the common name of curious slender aquatic plants, species of which are natives of Britain and the United States. They grow in ditches and pools, and they are named from having little bladders or vesicles that fill with air at the time of flowering and raise the plant in the water, so that the blossoms expand above the surface. The bladders have small openings in which insects are sometimes caught, and if the ditch or pool dries up, the vesicles hold moisture and keep the plant alive for some time.

Bla′densburg, MD., a town of Prince George co., 6 mi. n. e. of Washington, D. C. It was the scene of a battle Aug. 24, 1814, where the British invaders, under General Ross, defeated a force of American militia. See WAR OF 1812.

Blaine, JAMES GILLESPIE (1830–1893), an American statesman, born at West Brownsville, near Pittsburg, Pa., Blaine was educated at Washington College, from which he graduated when only seventeen years of age. He taught school and studied law for several years, was married in 1851 and three years later went to

JAMES G. BLAINE

Augusta, Maine, where he began editorial work on the Kennebec *Journal*, a weekly newspaper. He soon was offered a more influential position on the Portland *Daily Advertiser*. He joined the Republican party at its formation, early became its leader and practical dictator in Maine, was elected to the state legislature, where he served until 1862, and in 1863 took his seat in the House of Representatives. He was made speaker of the House in 1869, which position he held until 1874. While in Congress he made a number of important speeches on financial questions and participated in many celebrated debates, becoming known as a national leader of his party. He was later sent to the Senate, where he remained five years.

About this time he was accused of corrupt practices in securing legislation in favor of certain railroad projects in which he was interested. The charge was agitated by his political opponents and, together with certain parts of his record in Congress, made so many enemies that his great ambition to become president of the United States was never realized. He was unsuccessful in his candidature in 1876 and again in 1880, but became secretary of state under Garfield. After the death of Garfield, Blaine resigned and began his *Twenty Years in Congress*, a voluminous and valuable work. In 1884 he was nominated for president, but was defeated by Cleveland. When Harrison was elected president, Blaine was made secretary of state for the second time and fulfilled the duties of the office with distinction, dealing with several trying foreign questions with the utmost tact and ability. He was for years the leading exponent of the doctrine of reciprocity in commercial relations. He resigned from Harrison's cabinet and became a candidate for the nomination for president in 1892, but was defeated in the convention.

Blair, FRANCIS PRESTON (1791–1876), an American statesman, born in Virginia. Though originally a Whig, he was editor of the Washington *Globe*, the organ of Jacksonian Democracy, from 1829 to 1845; in 1856 he was active in the organization of the Republican party, presiding over the convention which nominated Fremont. He was a leader in the Chicago convention of 1860, which nominated Lincoln. He opposed the reconstruction measures after Lincoln's death, and became a Democrat.

Blair, FRANCIS PRESTON, JR., (1821–1875), son of Francis Preston Blair (1791–1876), born in Lexington, Ky. He served in the Mexican War, edited the Missouri *Democrat* and sat in the legislature of Missouri from 1852 to 1856. In the latter year he joined the Republican party and was elected to Congress, being reëlected in 1860 and 1862. He entered the volunteer army as a colonel and became major general in 1862. He commanded a division at Vicksburg, fought at Lookout Mountain and Missionary Ridge and marched with Sherman to the sea. After the war he returned to the Democratic party and was candidate for vice-president on the ticket headed by Horatio Seymour. In 1870 he was elected to fill a vacancy in the United States Senate, retiring in 1873.

Blair, HENRY WILLIAM (1834–), an American lawyer and statesman, born in New Hampshire. He served in the Civil War, and from 1866 to 1868 was in the state house of representatives and senate. He was in Congress from 1875 to 1879, became United States senator in 1879 and was reëlected in 1885. Blair, while in Congress, was a strong advocate of prohibition and woman suffrage, was the author of a bill providing for national support of common schools, in those states where it is not provided, and was sponsor for other important reform legislation. He was again a member of Congress from 1893 to 1895, when he retired.

Blair, JOHN INSLEY (1802–1899), an American capitalist and philanthropist, born in New Jersey. He founded the Lackawanna Coal and Iron Company, built the Delaware, Lackawanna & Western railroad, organized the railroad system of Iowa and constructed 2000 miles of railroad in that state and Nebraska. He was one of the original directors of the Union Pacific. He gave nearly $1,000,000 for schools and churches.

Blair, MONTGOMERY (1813–1883), son of Francis P. Blair, Sr., born in Kentucky. He graduated at West Point in 1835 and served in the Seminole War. In 1842 he became mayor of Saint Louis. In 1852 he moved to Maryland, becoming prominent in Democrat politics. He was counsel for the defendant in the Dred Scott case, joined the Republican party at its organization and became postmaster general in Lincoln's cabinet. During his term money orders, free delivery in cities and distribution of mail on cars were introduced. He resigned in 1864 and returned to the Democratic party.

Blake, EDWARD (1833–), a Canadian lawyer and statesman, born in Ontario. He graduated from University College in 1857, in 1867 became a member of the Canadian Parliament and was soon a leader of the Liberals, becoming in 1871 premier of Ontario. In 1873 he became a member of the Canadian cabinet and was chosen leader of the Liberal party in place of Mr. Mackenzie in 1880. He was one of the ablest speakers in the Dominion, and, going to England, he was elected to Parliament for an Irish constituency, as a pronounced Home Rule candidate. In 1896 he was appointed to the privy council.

Blake, ROBERT (1599–1657), a famous British admiral. He did not enter public life until, at the age of forty-one, he was sent to Parliament, where he won a name for himself in a short time. When the civil war broke out between the king and Parliament he raised a company of soldiers and took part in a number of land actions, winning great applause. In 1649 he was made a general of the sea, and he soon proved that this was his true sphere. He destroyed the squadron of Prince Rupert and wre ted from the royalists Guernsey, Jersey and the Scilly Isles. As a reward for these services he was made sole admiral, and he proved his fitness for the position by defeating the Dutch Admiral Tromp. Cromwell appointed him in 1654 to the command of the English fleet in the Mediterranean, and here he succeeded in upholding the dignity of the British flag in contests with the Dutch, the Spanish and the French. He attacked Tunis, the dey of which had insulted the British flag, and routed an army of three thousand Turks. At Algiers and at Tripoli he set free all the English slaves, and in 1657 he defeated the Spaniards at Santa Cruz.

Blake, WILLIAM (1757–1827), an English engraver and poet. His first two books of poems, *Songs of Innocence* and *Songs of Experience*, were illustrated with etchings by himself and the drawings were as singular as the poems Although throughout his life his work was laughed at as that of a madman, Blake was never shaken in his belief that he was a true poet and held converse with the souls of departed poets. Since his death he has met with much greater appreciation than during his life; Charles Lamb regarded him as one of the most extraordinary men of his age, and Swinburne has characterized him as "the single Englishman of supreme and simple poetic genius of his time."

Blanc, *blahN*, JEAN JOSEPH LOUIS (1812–1882), a French author and socialist. His theory was that all products of labor, material and intellectual, should be controlled by the government and portioned out to individuals according to their needs. Edward Bellamy in *Looking Backward* has presented this doctrine. Blanc wrote a *History of the French Revolution*, in twelve volumes, and a number of other works of considerable importance.

Blanc, MONT. See MONT BLANC.

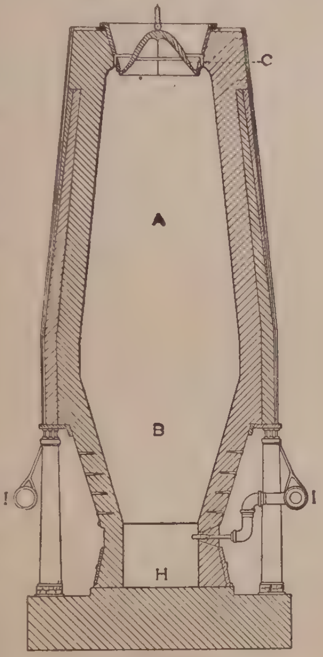
Blanc-mange, *blah mahNzh'*, in cookery, the name of different preparations of the consistency of a jelly, variously composed of dissolved isinglass, arrow-root, maize-flour and other substances, with milk and flavoring.

Bland, RICHARD PARKS (1835–1899), an American statesman, born near Hartford, Ky. He practiced law in Missouri, California and Nevada, where he was also interested in mining. He was a member of Congress from Missouri from 1874 to 1895 and from 1897 to his death, gaining special prominence as an advocate of the free coinage of silver and as author of the Bland-Allison bill of 1878. He was a prominent candidate for the Democratic nomination for president in 1896.

Blank Verse, verse without rhyme, first introduced into English poetry by the earl of Surrey, in the first half of the sixteenth century. The most common form of English blank verse, that which is used in the dramas of Shakespeare, is the line of five iambic feet. There is often an extra syllable in a line, and sometimes the accent is on the first syllable of the foot. From Shakespeare's time blank verse has been almost universally used by poet dramatists, although Dryden wrote his dramas in rhyme. The first use of the term blank verse is said to be in *Hamlet*, II, 2: "The lady shall say her mind freely, or the blank verse shall halt for't." The term is not applied to the Anglo-Saxon and early English alliterative unrhymed verse.

Blar'ney, a village in Ireland, 4 mi. n. w. of the city of Cork, with Blarney Castle in its vicinity. A stone called the Blarney Stone, near the top of the castle, is said to confer on those who kiss it the peculiar kind of persuasive eloquence termed "blarney," alleged to be characteristic of the natives of Ireland.

Blast'-furnace, the name given to the common smelting-furnace, used for obtaining iron from its ores with the aid of a powerful blast of air. This air-blast, which is propelled by a powerful blowing-engine and is now invariably heated to a high temperature (600° to 900° F.), is injected by pipes called tuyeres, situated in the lowest part of the furnace near to the hearth. The conical part next above the hearth is termed the boshes, and the interior is continued upward, sometimes in a tapered body or cone, sometimes as a perpendicular cylinder, which is surmounted by an opening for the introduction of the materials. The exterior consists of massive masonry of stone or firebrick, the body part being lined with two shells of firebricks, separated by a thin space to allow for expansion, this space being generally filled with sand, ground fire-clay or the like, to hinder the radiation of heat to the outside. When the body rises in the form of a perpendicular cylinder, it is called the barrel. The cone or barrel is sometimes clasped round on the outside by numerous strong iron hoops, or is cased with iron plates fastened to the masonry by iron bolts. The boshes are lined with firebrick or firestone, and the hearth is built with large blocks of stone which will resist the heat. A gallery is built around the top, and to this, material for charging the furnace is hoisted by an elevator.



BLAST FURNACE

A, stack; *B*, boshes; *H*, hearth; *C*, charging hopper; *I*, tuyeres.

The charging of the furnace goes on day and night, one charge consisting of a barrow-load of coal and a barrow-load of ore and limestone, the last mineral acting as a flux. These charges are constantly passing downward and undergoing a change as they come nearer the hotter parts of the furnace. Toward the lower part the earthy matter of the ore unites with the limestone and forms a slag, which finally escapes at an opening below the tuyeres or pipes through which the blast is supplied, and the molten metal drops down and fills the lower part, to be drawn off at stated periods. This is done usually twice in twenty-four hours, by means of a round hole called a tap. The furnace is constantly kept filled to within about two feet of the top. The ore put in at the top takes about thirty-six hours before it comes out as iron. In the newer forms of furnaces the top is closed, and the gases formerly burned at the top are conveyed by pipes, to be utilized as fuel in heating the blast and in raising steam for the blowing-engine. The principle adopted is to close the top by a bell-and-cone arrangement, which is opened and shut at pleasure by hydraulic or other machinery. The height of furnaces varies from fifty to eighty feet, and in some cases to upward of one hundred feet, and the greatest width is about one third of the height.

On the Egyptian tombs at Thebes metal-workers are represented as using the blow-pipe more than 2000 years before Christ, and Indian and other Oriental workers in metals still use a primitive bellows for smelting. This was the germ of the blast furnace. Roman historians say that iron was employed by the Britons in manufacturing spears and lances, which required some sort of blast. The Romans themselves, when they occupied Britain, employed iron to a considerable extent, as is evidenced by cinder heaps in the Forest of Dean, in Gloucestershire and elsewhere. But so rude was their process that those heaps in the Forest of Dean furnished the chief supply of ore for twenty furnaces during 200 or 300 years. The English iron founders who employed these remains melted them in furnaces of a simple form, called *air-bloomeries*, which they erected on the tops of hills, in order to obtain the greatest possible blast of wind. See IRON.

Blast′ing, the operation of breaking up masses of rock or other hard substances, by means of explosives. In ordinary operations holes from 1 to 6 inches in diameter are bored into the rock by means of a steel-pointed drill. After the hole is bored to the requisite depth, it is cleaned out, the explosive is introduced, the hole is *tamped* or filled up with broken stone, clay or sand, and the charge is exploded by means of a fuse or by electricity. In larger operations, mines or shafts of considerable diameter take the place of the holes above described, and the excavations are made by machinery. Shafts are sunk from the top of the rock to various depths, sometimes upward of 60 feet. This shaft joins a heading, or gallery, driven in from the face, if possible, along a natural joint; and from this point other galleries are driven some distance in various directions, with headings at intervals, returning toward the face of the rock and terminating in chambers for the charges. Enormous charges are frequently made use of, upward of twenty tons of gunpowder having been fired in a single blast.

One of the greatest blasting operations ever attempted was the removal of the reefs in the East River, near New York, known as Hell Gate. An entrance shaft was sunk on the Long Island shore, from which the reef projected. From this shaft nearly twenty tunnels were bored in all directions, extending from 200 to 240 feet, and connected by lateral galleries. Upward of 52,000 pounds of dynamite, rend-rock and powder were used, and millions of tons of rock were dislodged. See DYNAMITE; GUNPOWDER; NITROGLYCERINE.

Blavatsky, *bla vahts'ke,* HELENA PETROVNA HAHN-HAHN (1831–1891), a Russian theosophist, born in Ekaterinoslav. She traveled extensively and gained considerable reputation through her dealings with occult science and spiritism. She became thoroughly familiar with the Buddhist philosophy and other doctrines of the East and established in Bombay the *Theosophist.* Later investigations proved her pretended miracles impostures, and she lost her prestige. She was a voluminous writer. The most important of her works is *Isis Unveiled,* which is the text-book of her followers.

Bleach'ing, the art of freeing textile fibers and fabrics from their natural color and rendering them white. The ancient method of bleaching was by exposing the fabrics to the action of the sun and frequently wetting them. This method was employed by the Egyptians, Babylonians and other peoples of antiquity. Modern bleaching seems to have originated with the Dutch, and for a long time they held a monopoly of the business for Europe. Their method was similar to that employed by the ancients and usually required an entire season for bleaching linen. The cloth was repeatedly steeped in lye, soaked in buttermilk, washed and spread upon the grass to whiten. Because of the great skill attained by these people, the name *hollands* was applied to the best grades of linen and is still retained; because of the method of bleaching the finest fabrics, by spreading them on the best plots of grass land, such fabrics were called *lawns.*

The Dutch method of bleaching has now been displaced by what is known as the *chlorine* process. This consists of cleaning the cloth, then boiling it for about twelve hours in a solution of water and slaked lime, to which a small quantity of caustic soda is added After the boiling the cloth is washed, then passed through a pure solution of hydrochloric acid, washed again and then soaked for from two to four hours in a bleaching solution. This is prepared by dissolving bleaching powder (chloride of lime) in water, and adding a quantity of this to the bath. When taken from the bleaching solution, the cloth is again washed, then placed in a weak solution of sulphuric acid, which completes the process. After bleaching, the cloth is passed through a wash containing bluing; it is then starched, dried, calendered and packed for the market. In large bleaching houses the work is all done by machinery.

Blende, *blend,* an ore of zinc, a mineral composed of zinc and sulphur and constituting the ore from which most of the zinc of commerce is obtained. It occurs in both massive and crystallized forms, and in color it is yellow, brown or black. In the United States, deposits of blende occur in Illinois, Iowa, Missouri and Wisconsin. The most valuable European deposits are in Cornwall, England, in Saxony and in the Hartz Mountains. See ZINC.

Blenheim, *blen'im,* a village in Bavaria on the Danube, 23 mi. n. n. w. of Augsburg. Near it was fought in 1704, during the War of the Spanish Succession, the famous Battle of Blenheim, in which the allied forces of England and Germany, under the duke of Marlborough and Prince Eugene, gained a victory over the French and Bavarians. The residence of the dukes of Marlborough at Woodstock, Oxfordshire, was named from this victory.

Blen'nerhas'sett, HARMAN (1764–1831), a wealthy English-American, chiefly noted for his connection with the plot of Aaron Burr to found an independent empire in the southwest. He was born at Hampshire, England, educated at London and at Trinity College, Dublin, but came to the United States in 1797 and settled on an island in the Ohio River below Parkersburg. Here, in 1805, he entertained Aaron Burr, who induced him to join in his treasonable conspiracy. When the scheme fell through, Blennerhassett was tried for treason, and though he was finally discharged he lost his property. See BURR, AARON.

Bles'bok, an antelope of South Africa, with a white marked face, a general purplish-chocolate body and a saddle of a bluish color. It was formerly found in great numbers in the Transvaal and Orange Free State, but has been too much hunted.

Bles'sington, Marguerite, Countess of (1789–1849), an English author and society leader. After the death of her second husband, the earl of Blessington, Lady Blessington, who was noted all over the continent for her beauty and brilliant conversation, held a little court of her own at her family mansion, Gore House, in London. Here she gathered about her the most distinguished men of her time. On the accession to power of Louis Napoleon, she went to France. Her most valuable literary work is the *Conversations with Lord Byron.*

Blight, *blite,* a generic name commonly applied to denote the effects of disease upon plants, or any other circumstance which causes them to wither or decay. It has been vaguely applied to almost every disease of plants from any cause whatever. The term is frequently limited, however, to disease in cereal crops, and botanists confine it to diseases originating from bacteria or parasitic fungi.

Blind, Education of the. The first book calling attention to the duty of educating the blind was published in Italy in 1616. While various attempts had been made to relieve the sufferings of these unfortunate persons, it was not until the latter part of the eighteenth century that any attempt was made to give them systematic instruction. The first school for this purpose was founded by Valentin Hauy in Paris in 1784. A similar school was established in England in 1791, and the success of these institutions was such that within the next twenty years schools for the blind were established in all of the leading countries of Europe. The first school in the United States was established in Massachusetts in 1829, as the New England Asylum for the Blind. From the start this school received aid from the state, and the other New England states availed themselves of the advantages it offered by sending, at state expense, their blind to this institution. The New England Asylum was later changed to the Perkins Institute and Massachusetts Asylum for the Blind, which, under the direction of Dr. Samuel G. Howe, became the leading institution of its kind in the country, and now, with the Pennsylvania Institution at Philadelphia, ranks among the most noted in the world. Soon after its founding, the Perkins Institute gave exhibitions by its pupils before the legislatures of a number of different states, and the influence of this work was such as to secure the establishment of like institutions in many parts of the country. The work has spread until now nearly every state includes institutions for the education of the blind in its school system.

The education given is along three lines: *literary,* including the branches taught in most high and secondary schools, with the exception that less attention is given to foreign languages; *musical,* including instruction on the piano, organ and other instruments, musical composition and the training of the pupils for giving lessons upon the different instruments; *industrial,* training in those occupations in which the blind can successfully engage, such as broom-making, basket-making, mattress-making, and sewing, knitting, crocheting, carpet-weaving and piano-tuning. In these lines many of the students become experts. For a long time the pianos in the public schools of Boston have been kept in tune by members of the Perkins Institute.

Since the blind obtain the greater part of their knowledge through the sense of touch, special books and apparatus are necessary for giving them a literary education. The first attempts at teaching the blind to read were by the use of raised letters, which in form were similar to the ordinary letters of the alphabet. They learned the forms of the letters by running the fingers over them, and in this way learned to read. Another system, known as the *point* system, is now in very general use. By this, different numbers of dots indicate the different letters of the alphabet. The advantage of this system over the other is that it enables the blind to write as well as read. The point is written by the use of an apparatus consisting of a board with a grooved surface, over which a frame is fitted. The paper is placed on a board, the frame is laid upon it, and the points are made by the use of a stiletto, which is used with an abbreviated metal rule. The writing is from right to left, since the paper is reversed for reading. In all of the best schools both the point and the alphabet system are in use. The advantage of the alphabet system is that it enables blind children to learn to read either at home or in the public schools. before they are old enough to enter an institute. Geography is taught by the use of relief maps, in which the towns are indicated by metallic points, the boundaries by raised lines, and the mountains, valleys and rivers in the ordinary manner of relief maps. Natural history is taught by the use of life-size models and mounted specimens of animals and birds, while botany is taught in a similar manner, only the models are larger than the plants which they represent, in order that the parts may be ascertained by touch.

In some large cities kindergartens for the blind have been provided, and the work is very successful, all of the kindergarten occupations, except those in which the blending of colors is required, being taught.

Special printing establishments are maintained at Louisville, Ky., and in connection with the Perkins Institute in Boston. Through these, a library of about 100,000 volumes of the choicest works has been printed, and in the Congressional Library at Washington a special reading room has been provided, in which copies of these books are found. Copies are also distributed through the different institutes, so that reading matter is provided not only for those in the schools but for others.

Blindfish, the name of several species of fish inhabiting American caves. They are all small, the largest not exceeding five inches. In the typical species of the Mammoth Cave of Kentucky, the eyes are reduced to a useless rudiment hidden under the skin, the body is translucent and colorless and the head and body are covered with numerous rows of sensitive projections, or papillae, which form very delicate organs of touch.

Blindness, the lack of, or the deficiency in, the sense of sight. Blindness may vary in degree from the slightest impairment of vision to total loss of sight; it may also be temporary or permanent. It is caused by defect, disease or injury of the eye, of the optic nerve or of that part of the brain connected with it. Old age is sometimes accompanied by blindness, occasioned by the drying up of the humors of the eye, or by the opacity of the cornea or the crystalline lens. There are several causes which produce blindness from birth. Sometimes the eyelids adhere to each other, or to the eyeball itself; often a membrane covers the eyes; sometimes the pupil of the eye is closed, or adheres to the cornea, or is not situated in the right place, so that the rays of light do not fall in the middle of the eye. The blind are often distinguished for a remarkable mental activity and for a wonderful development of the intellectual powers. Their touch and hearing, particularly, become very acute. See BLIND, EDUCATION OF; KELLER, HELEN.

Blind'worm or **Glass Snake**, a reptile, forming a connecting link between the lizards and the snakes. It is snake-like in form, has no appearance of external limbs, is about a foot in length and is of nearly equal thickness throughout. Its eyes, though brilliant, are small, and hence its common name. It is common in Great Britain and over almost the whole of Europe, western Asia, northern Africa and the United States. It is perfectly harmless, and when frightened it stiffens its muscles to such an extent that its tail may be snapped off by a slight blow. Blindworms live upon worms, insects and snails and hibernate during the winter.

Bliss, CORNELIUS NEWTON (1833–), an American merchant and statesman, born in Massachusetts. He engaged in business in Boston, but in 1866 moved to New York City, where he was a member of the dry goods house of Bliss, Fabian & Co. He arose to political prominence as treasurer of the Republican national campaign committee in every election from 1892 to 1904. President McKinley appointed him secretary of the interior in 1897, but he resigned in December, 1898.

Bliss, PHILIP PAUL (1838–1876), an American evangelist, born at Clearfield, Pa. In company with the evangelist Dwight L. Moody, he held mission services in all parts of the United States, leading in the singing of hymns of his own composition. *Hold the Fort*, *Pull for the Shore*, *Hallelujah*, *'Tis Done* are the best known of these. He was killed in the terrible Ashtabula, O., railroad wreck.

Blis'ter, an application which, when employed on the skin, raises the cuticle in the form of a sac, which fills with serous fluid. The Spanish fly blister operates most certainly and most quickly and is commonly used; but mustard, croton oil, ammonia and other subtances are also used.

Blister-steel. See STEEL.

Bliz'zard, the name given to a severe storm accompanied by a strong, cold wind and fine, dry snow or spicules of ice. The term applies particularly to storms of this character which are common during the winter in the northern part of the Mississippi basin, especially in the Dakotas and Minnesota, though they may extend as far south as the Ohio River. The blizzard is usually preceded by a short period of warm weather and comes without apparent forewarning, often causing loss of life among people who are far from home. During the storm the condition of the atmosphere is such as to make it exhausting both to men and animals, while the air is so completely filled with fine snow that it is impossible to see objects at a distance of more than a few feet. The weather bureau is now usually able to forecast the approach of these storms, so as to warn the inhabitants in time to enable them to find shelter before the storm breaks.

Block, a mechanical contrivance consisting of one or more grooved pulleys, mounted in a casing or shell, which is furnished with a hook, eye or strap by which it may be attached to an object, the function of the apparatus being to transmit power or change the direction of motion by means of a rope or chain passing round the movable pulleys. Blocks are single, double, treble or fourfold, according as the number of sheaves or pulleys is one, two, three or four. A *running block* is attached to the object to be raised or moved; a *standing block* is fixed to some permanent support. Blocks also receive different names from their shape, purpose and mode of application. They are made of either iron or wood. By the use of blocks heavy weights can be raised with comparatively little power. See Pulley.

Blockade′, the closing of the seaports of a country to the shipping of its enemy. By the law of nations, announcement must be made of a blockade, so that neutral nations may have notice of it. If then any attempt is made to trade with a blockaded port, the vessels and cargoes are confiscated if captured. In a wider sense, the term blockade is applied to land operations which entirely cut off communication of any city with the surrounding world, although siege is a more common word to describe this latter method of reducing a city.

Block′house. In early times, and in localities where danger from enemies was always present, houses were built of heavy logs or blocks of hewn timber and were fitted with loopholes for musketry. When of more than one story, the upper stories were made to overhang those below, and in the overhanging floors loopholes were cut so that the defenders might fire down upon an enemy who undertook to break into the house or burn it. Such blockhouses were in general use among the American colonists in their wars with the indians.

Block System. See Railroad, subhead *Railway Signals.*

Bloemfontein, *bloom′fon tine,* the capital and chief town of Orange River Colony, South Africa, situated on the Modder River, 600 mi. n. e. of Cape Town and 95 mi. e. of Kimberley. The city is built on a plateau, about five thousand feet above sea level, in a very healthful region. Among the fine buildings are the Anglican cathedral, the Dutch Reformed church, the town hall, a library, a national museum and the council chamber for the legislature. The city also has several educational institutions, a government hospital and an asylum for the insane. It is on the main line of the Cape-to-Cairo railway, and it has direct connection by rail with Cape Town. Bloemfontein was an important military town and one of the strongholds of the Boers in the South African War. It surrendered to the British under Lord Roberts, March 13, 1900. Population, about 12,000.

Blondel, *bloN del′*, a French minstrel and poet of the twelfth century, the confidential servant and instructor in music of Richard the Lion-hearted. While his master was the prisoner of the duke of Austria, Blondel, according to the story, went through all parts of Germany in search of him. He sang the king's own favorite lays before each keep and fortress till the song was at length taken up and answered from the windows of the castle of Durrenstein, where Richard was imprisoned. This story is preserved in the chronicles of Rheims, of the thirteenth century.

Blondin, *bloN daN′*, Charles Emile Gravelet (1824–1897), a noted French gymnast. In 1851 he joined the famous Ravel family of acrobats and came with them to America, and during his travels on this continent he visited Niagara. He was at once struck with the opportunity offered for realizing his ambition, and he took up his abode near the falls to study the practicability of crossing the river over the falls on a tight wire. He bridged the distance with a hempen cord, eleven hundred feet in length, at an altitude of one hundred sixty feet above the river. On August 17, 1859, he made the trip in the presence of fifty thousand spectators. Not content with simply walking across, he elaborated his performance; he made other trips blindfolded and with a man on his back. Later he repeated this feat in the presence of the prince of Wales.

Blood, *blud,* the fluid which circulates through the arteries and veins of the human body and is essential to the preservation of life and the nutrition of the tissues. The blood in the veins is a dark red, but in passing through the lungs it absorbs oxygen and becomes a bright scarlet color, as seen in the arteries. The normal temperature of the blood is 98⅗° F. When ordinary blood stands for a time it separates into two portions, a red coagulated mass consisting of the fibrin and corpuscles, and a yellowish watery portion, the serum. The blood *corpuscles* are minute red and white bodies floating in the fluid of the blood. The red ones, round, flattish discs, give color to the fluid and carry oxygen to the tissues. The white or colorless corpuscles are spherical and rather larger than the red ones. Their use is not perfectly known. See CIRCULATION.

Blood has come to have many commercial uses. The Scandinavians, the first people who, when they butchered animals, preserved the blood, used it in making blood-cake and blood-sausage All the large packing houses now save the blood, manufacturing it into fertilizers that sell at from $32 to $45 a ton.

Blood is also used in the manufacture of sugar, to collect all the floating products in the sugar and carry them to the bottom of the tank. Many of the dark, rich-colored buttons are made of blood pressed into the proper form by means of hydraulic machines. Imitation tortoise shell articles are composed largely of blood, and it is used extensively by the Japanese in lacquer work. Nearly all drug stores keep blood from which the fibrin has been taken, and many physicians prescribe it in cases where the patient's blood is "thin," or lacks the necessary amount of red corpuscles.

Blood, AVENGER OF, the name applied to one who executes vengeance on the slayer of a kinsman. In primitive society, when a man was killed or seriously injured, the punishment of the person committing the crime devolved, by the so-called right of blood feud, upon the next of kin of the injured person. As society advanced, there was gradually developed the right of sanctuary, and places of refuge were provided where a manslayer might be safe for a time from the avenger of blood. Still later, it was provided that the criminal might gain exemption by paying a fine, which the avenger was compelled to accept.

Blood'hound, a variety of dog with long, smooth, hanging ears, remarkable for the acuteness of its smell. It takes its name from its habit of following the trail of wounded prey by the scent of the blood. Among the several varieties of this animal are the English, the Cuban and the African bloodhound, most of which are tawny in color, with black noses. In former times bloodhounds were not only trained to the pursuit of game, but also to the chase of man. In America they were occasionally employed in hunting fugitive slaves, but they are now only used once in a while for tracking criminals and escaped convicts.

Blood'-money, the compensation paid by a manslayer to the next of kin of the person slain, securing the offender and his relatives against vengeance. It was once common in Scandinavian and Teutonic countries and is still seen among the Arabs. Certain crimes, such as killing a sleeping person, were regarded as too heinous to be atoned for by a money payment, and the criminal was turned over to the vengeance of the relatives of the man slain.

Blood'root, a plant of Canada and the United States, belonging to the poppy order, so named because its rootstock yields a sap of a deep orange color. The leaves are heart-shaped and deeply lobed, and come from the ground singly, folded around the flower stalk, which bears one white or rose-tinted blossom. The plant has acrid narcotic properties and has been found useful in various diseases.

Blood'y Assi'zes, the term of court held by the English Judge Jeffreys in 1685, after the suppression of Monmouth's rebellion. Upward of three hundred persons were executed after short trials; very many were whipped, imprisoned and fined, and nearly one thousand were sent as slaves to the American plantations.

Bloom'er Costume, a style of dress for women, consisting of a jacket with coat sleeves, a pair of full, loose trousers gathered into bands at the ankles, and a skirt reaching a little below the knees. This style originated in 1849 in America and was adopted by Mrs. Bloomer of New York, whence the name. An improvement of this costume has gained popularity among woman bicyclists and golf players, and has also been much worn in the gymnasium.

Bloom'field, N. J., a town in Essex co., near Newark and 10 mi. n. w. of New York City, on the Erie and the Lackawanna railroads and on the Morris canal. There are important manufactures, including organs, woolen and rubber goods, electric elevators, saddlery and hardware. The residences of many New York business men are located here, and it is the seat of the German Theological Seminary of Newark. Other interesting features are the Jarvie Library, the Westminster and First Presbyterian churches, and a public park which was the Common, used during the Revolution as a training ground. The place was settled in 1685 as Watsessing. Population in 1910, 15,070.

Bloomfield-Zeisler, *bloom'feeld zise'lur,* FANNY (1866–), an American pianiste, born in Austrian Silesia. Her parents removed to Chicago, Ill., in 1868 and there provided liberally for their daughter's musical education. When she was eleven years old, her playing attracted the attention of eminent foreign musicians, and in the following year she began to study with Leschetizky. Before she was twenty years old she had played with success in most of the European musical centers, and soon after, returning to America, attained instant popularity, being considered one of the foremost pianists of the time.

Bloom'ington, Ill., the county-seat of McLean co., 126 mi. s. w. of Chicago, on the Chicago & Alton, the Illinois Central, the Big Four and other railroads. The city contains railroad shops and manufactories of machinery, stoves and agricultural implements, flour mills, furnaces and brick-yards. There are also extensive coal-mining, pork-packing and fruit-canning industries. Illinois Wesleyan University is located here and the Illinois State Normal School is at Normal, two miles north. Bloomington has a marble courthouse, a fine city hall and a public library; it owns and operates its waterworks and electric-lighting plant. It was settled in 1831 and became a city in 1850. Population in 1910, 25,768.

Bloomington, Ind., the county-seat of Monroe co., 50 mi. s. w. of Indianapolis, on the Chicago, Indianapolis & Louisville railroad. The city is the seat of the Indiana State University; it has vast limestone quarries, furniture, leather and hardware factories. The first settlement was made about 1818. Population in 1910, 8838.

Blooms'burg, Pa., the county-seat of Columbia co., 40 mi. s. w. of Wilkesbarre, on the Susquehanna River and the Pennsylvania canal and on the Lackawanna, the Philadelphia & Reading and other railroads. The city is in a region producing iron, and it has furnaces, foundries, textile works, lumber mills and woodworking factories. Bloomsburg is the seat of one of the state normal schools. Population in 1910, 7413.

Blouet, *bloo ay'*, Paul. See O'Rell, Max.

Blouse, *blowz*, a light, loose upper garment, made of linen, cotton or woolen and worn by men as a protection from dust, or in place of a coat. A blue linen blouse is the common dress of French workmen. It is also a sort of coat forming a part of the undress uniform of the United States army.

Blow'fly, a large blue and black fly, that lays its eggs upon meat or dead animals. These eggs are called *fly blows*, and hatch very quickly into maggots, which destroy the meat.

BLOWFLY

Blow'ing Machine, a device for supplying a continuous current of air under pressure. Blowing machines are used in connection with smelting furnaces for iron, in blowing glass and for ventilating mines and large buildings. The simplest and oldest pattern of blowing machine consists of a pair of cylinder and piston bellows. In this the downward stroke of the piston forces the air through the pipes into the fire or other place where it is needed. Since the pistons act alternately, a continuous current of air is maintained (See Bellows). But the blowing machine now generally used is the fan or fan blast machine. In its most common form the fan consists of four spokes of a rimless wheel, tipped with vanes and made to rotate in a cylindrical chest, in which it has often a slightly eccentric position. There are openings on both sides round the spindle for admission of air, which, sucked in by the centrifugal action of the fan as it quickly rotates, flows toward the vanes, and is driven through an exit pipe attached to another part of the cylinder. A new form of blower has a chamber in which three drums of equal size are enclosed, two in a line below and one above; the upper one is provided with wings, and the two lower have wide slots along their entire length, allowing the wings to enter in the course of rotation. The function of the two lower drums is to supply alternately abutments to prevent the escape of the air. They are caused to revolve in proper relation with the motion of the upper drum by spur-wheels on the journals, which mesh into another spur-wheel on the shaft of the upper drum. In the moving parts of this machine there are no parts that come into actual contact except the teeth of the spur-wheels.

Blow'pipe, an apparatus for driving a current of air through the flame of a lamp, candle or gas jet. and directing it upon any substance desired. In its simplest form the blowpipe is merely a conical tube of brass or glass, usually seven inches long and one-half inch in diameter at the larger end and tapering so as to have a very small aperture at the smaller end. Within about two inches of the smaller end the pipe is bent nearly to a right angle, so that the stream of air may be directed sidewise to the operator. The flame, if turned to a horizontal direction, takes a conical shape and consists of two different parts, each recognized by its peculiar color. The greatest heat is obtained at the tip of the inner or blue flame, if the substance subjected to it is burned or oxidized. For instance, a small piece of lead or copper placed at this point is soon changed to lead or copper oxide, and hence the name of this flame is the *oxidizing* flame. By moving the substance to the interior blue flame, which contains no oxygen, the oxide will be removed and the pure metal will be left. For this reason this has been called the *reducing* flame. Many minerals can be either oxidized or reduced at pleasure, and the blowpipe forms a ready test in the hands of the mineralogist. The current of air is often produced by bellows instead of the breath, this instrument being fixed in a frame for the purpose.

The oxy-hydrogen pipe is an apparatus for burning oxygen and hydrogen in the proportions in which they form water. The gases are confined in copper cylinders under great pressure. The blowpipe consists of two tubes, one within the other, and having a common small opening. The hydrogen is lighted; then the oxygen is introduced into the center of the flame, making a small, blue, needle-pointed flame which produces intense heat. In the production of lime light, illuminating gas usually takes the place of hydrogen. See LIME LIGHT.

Blub'ber, the fat of whales and other large sea animals, from which train oil is obtained. The blubber lies under the skin and over the muscles. It is eaten by the Eskimo and the sea-coast races of the Japanese islands. The whole quantity yielded by one whale ordinarily amounts to from two to four tons.

Blücher, *blüK'ur*, GEBHARD LEBERECHT VON, prince of Wahlstadt (1742–1819), a distinguished Prussian general. He entered the Swedish service when fourteen years of age and fought against the Prussians, but he was taken prisoner in his first campaign and was induced to enter the Prussian service. He commanded with distinction against the French on the Rhine in 1793 and 1794, took possession of Erfurt and Mühlhausen in 1802. and in 1806 fought at the Battle of Auerstadt. After the Peace of Tilsit he was employed in the department of war at Königsberg and Berlin. In the campaign of 1812, when the Prussians assisted the French, he took no part, and Napoleon, realizing Blücher's hatred of France, had him removed from his command When seventy years old, he was appointed commander in chief of the Prussians in the renewed struggle against France, and his heroism was shown in the battles of Lützen and Bautzen. He led the Prussian army which invaded France early in 1814 and entered the capital of France, and on the renewal of the war in 1815 the chief command was again committed to him, and he led his army into the Netherlands. Napoleon threw himself upon him, and Blücher, on June 16, was defeated at Ligny. In the Battle of Waterloo Blücher arrived at the most decisive moment and assisted materially in completing the great victory of the allies. His energy and rapid movements procured for him the name of "Marshal Vorwarts" (Forward).

Blue, one of the seven primary colors, seen in nature in the clear sky and the sea. The various shades of blue are most brilliantly displayed in the sapphire and the turquoise. In the arts blue is used as a dye and is derived from products of the vegetable, animal and mineral kingdoms. Indigo is the most common vegetable material for producing it. The principal blues used in painting are ultramarine, Prussian or Berlin, Bremen and cobalt.

Blue'beard, the hero of a well known tale. originally French, which was introduced into England in the seventeenth century. Though Bluebeard is a fictitious character, it is believed that his story was founded on the enormities of a certain Gilles de Laval, Baron de Retz, who lived in the fifteenth century.

Blue'bird, one of the favorite wild birds of the United States, lovable because of its bright color and pretty ways and its sweet song. The bluebird appears among the earliest of the birds that go north in the spring, and, if undisturbed, it stops in the Northern states and builds its nest fearlessly in a hollow stump, fence post or other retreat very near houses and people. The same pair will nest year after year in a place that they find to their liking. They are fine songsters, and their cheerful notes may be heard throughout the entire season, though most frequently in early spring. The bluebird is a small thrush, with bright blue back, reddish throat and breast and white under parts. The bluebird is frequently disturbed by the English sparrow, and has been practically driven from some localities.

Blue Books, the official reports, papers and documents printed for the British government and laid before the Houses of Parliament, so called from being stitched up in dark-blue paper wrappers. They include bills presented to, and acts passed by, Parliament; all reports and papers called for by members, or granted by government on particular subjects, and the reports of committees. The name is also given in America and England to a book containing the names of persons holding public offices.

Bluefield, W. VA., is situated on the Norfolk & Western Railroad, 100 mi. w. of Roanoke, Va. The city is the center of an extensive coal industry. Population in 1910, 11,188.

Bluefields, a city of Nicaragua, situated on the Mosquito Coast near the mouth of the Bluefields River. It has a land-locked harbor, and is connected with Galveston and New Orleans by direct lines of steamers. It is the seat of a United States Consular Agency and a Moravian Mission. Population about 15,000.

Blue'fish, a sea fish, common on the eastern coasts of America, allied to the mackerel, but larger, growing to the length of three feet or more, and much esteemed for the table. It is very destructive to other fishes. Bluefish are taken in nets and by hook, furnishing by the latter method great sport. New York City alone uses $250,000 worth of bluefish in a year.

Blue Grass, an American pasture grass of great excellence, especially abundant in Kentucky, which is known as the Blue Grass State. Blue grass thrives best on clay soils overlying limestone, and it is excellent for lawns.

Blue Island, ILL., a city of Cook co., on the Calumet River and on the Illinois Central, the Rock Island, the Grand Trunk and other railroads. It is a suburb of Chicago, about two miles south of the city limits, and is an important railroad center. There are smelting works, oil-works, breweries, brick-yards and stone-quarries. Blue Island was settled in 1833 and was incorporated in 1872. Population in 1910, 8043.

Blue Jay. See JAY

Blue Laws, a name for certain laws formerly believed to have been made in the early government of New Haven, Conn., but now known to have been the product, in large part, of the brain of Rev. Samuel Peters, a minister who was driven from the colony to England, and who thereafter devoted himself to ridiculing the Americans. Among those which he declared had been passed were the following:

"No food or lodging shall be offered to a Quaker, Adamite or other heretic.

"No one to cross a river but an authorized ferryman.

"No one shall run on the sabbath day, or walk in his garden, except reverently to and from meeting.

"No woman shall kiss her child on the sabbath or fasting day.

"No one shall buy or sell lands without permission of the selectmen.

"Whoever wears clothes trimmed with gold, silver, or bone lace above two shillings by the yard, shall be presented by the grand jurors, and the selectmen shall tax the offender at 300 pounds estate.

"No one shall read common prayer, keep Christmas or saint-days, make minced pies, dance, play cards, or play on any instrument of music, except the drum, trumpet and Jew's-harp.

"Every male shall have his hair cut round according to a cap." See CONNECTICUT, subhead *History*.

Blue Moun'tains, the name applied to several ranges of mountains in different parts of the world: (1) The Blue Mountains of New South Wales, which run nearly parallel to the coast and form a part of the mountain system of Australia. This range extends from Wilson's Promontory on the south to Cape York on the north, and has an altitude of over 4000 feet. (2) The Blue Mountains of Jamaica. These form the most important range of the island and traverse it nearly its entire length. Their greatest altitude is nearly 8000 feet. (3) The Blue Mountains of New York, New Jersey and Pennsylvania, more properly known as the Kittatinny. These mountains are east of the Blue Ridge and should not be confounded with them. (4) The range of mountains in Oregon and Washington. They separate the Columbia River from the Great Basin and have an altitude of from 8000 to 9000 feet. Their sides are heavily wooded.

Blue Pe'ter, a blue flag having a white square in the center, used to signify that the ship on which it is hoisted is about to sail. In the United States navy the sailing signal is a flag called the cornet.

Blue Print, a photographic picture obtained by the use of a cyanide. The process is in common use by architects and engineers for copying plans. The sensitive paper is prepared by brushing it over with a solution of oxalic acid and iron and then treating it with a solution of potassium ferrocyanide. When this paper is exposed to light under the drawing, which is made on vellum or other very translucent paper, a photograph is imprinted upon the sensitive paper. On washing in pure water, this is developed in the form of a blue print. The lines of the drawing protect the cyanide from the action of light, and in washing those portions are dissolved, leaving upon the picture white lines in place of the black lines in the drawing. Sunlight or electric light may be used for the process. Blue prints of photographic negatives can be made in the same manner.

Blue Ridge, the most easterly ridge of the Alleghany or Appalachian Mountains. It extends from West Point, N. J., to the northern boundaries of Alabama and Georgia. In the southern portion it is crossed by several ranges, the most important being the Black Mountains, the Nantahala and the South Mountains. The name Blue Ridge proper refers to that portion of the range which crosses Virginia and separates the Piedmont region from the Great Valley. The most elevated summits are the Peaks of Otter (4000 feet), in Virginia.

Blun′derbuss, an old-fashioned smooth-bore gun, the barrel of which terminated in a somewhat bell-shaped muzzle. Several bullets could be put in at one load. It made an effective weapon at short range.

BLUNDERBUSS

Blush′ing, or the reddening of the face and neck through modesty, confusion or shame, is a local modification of the circulation of the blood, brought about by the nerves refusing to act on the muscular coat of the tiny arteries, which thus become larger and allow more blood to flow through them. The cheeks become red, or the flush may extend to the roots of the hair or "all over." Terror may make the face pale, and the skin may grow cold, by over-stimulating the nerves, which thus cause the tiny blood-vessels to contract and lessen the amount of blood.

Bo′a, a genus of South American serpents of great size and enormous strength. They seize and crush in the folds of their strong bodies animals as large as sheep and deer, and, having broken the bones, they are able to swallow the animals entire, the neck stretching to many times its own diameter. After eating, the snake remains sometimes for several weeks without motion and seemingly more than half asleep. The *boa constrictor,* which rarely exceeds twenty feet in length, is not one of the largest of the boas, but the name boa constrictor is often given by the public to any large serpent of similar habit; consequently, the term in common speech includes the pythons of the Old World and the anaconda and other large serpents in America. The only members of the boa family in the United States are two or three small species found in and around Arizona. See Python; Anaconda.

Boadicea, *bo′ad i se′ah,* (?–62 A. D.), queen of a tribe of early Britons. Having been treated in the most ignominious manner by the Romans, she headed a general insurrection of the Britons, attacked the Roman settlements, reduced London to ashes and put to the sword all strangers to the number of seventy thousand. Suetonius, the Roman general, defeated her in a decisive battle, and Boadicea, rather than fall into the hands of her enemies, put an end to her own life by poison.

Boar, *bor,* the wild hog of Europe and North Africa. The boar-hunt on foot, with spears for weapons, was once the favorite amusement in England and northern Europe. The boar was very strong, fierce and fleet, and was armed with curving tusks, which could inflict dangerous wounds. The chase was therefore very exciting. In India a popular sport is to hunt the native boar on horseback. Boars are much larger than domesticated hogs and are covered with short hair and stiff bristles, which form a crest along the spine. They feed in the night time on vegetables of different kinds.

BOAR

Board'man, George Dana (1828–1903), an American Baptist clergyman, born in Burma and educated at Brown University and Newton Theological Seminary. In 1864 he became pastor of the First Baptist Church in Philadelphia and held the position for thirty years. Later he established the lectureship known as the Boardman Foundation in Christian Ethics at the University of Pennsylvania. He was president of the Christian Arbitration Peace Society and the American Baptist Missionary Union, and was one of the most influential men in the denomination. Among his published works are *Titles of Wednesday Evening Lectures*, *The Problem of Jesus*, *The Disarmament of Nations*, *The Two Bibles* and *The Golden Rule*.

Board of Trade, an association of merchants, traders, producers and other persons engaged in commercial pursuits for the purpose of facilitating trade by united action, of providing a court of arbitration in commercial questions, and generally of attaining, by combination, advantages in trade beyond the reach of individual enterprise or responsibility. Marseilles, in France, was the first city in the world to establish a board of trade. This partook partly of a political character, and it shared in the control of municipal affairs. In 1700 the Chamber of Commerce of Paris was established. The Chamber of Commerce of Glasgow is the oldest in Great Britain, having been established in 1783. The London Chamber of Commerce, or the Royal Exchange, is the grand center of the commerce of the Old World. Next to it in importance stands the Liverpool Exchange, with which American commercial dealers have the most direct connection. The Manchester, Hull, Leeds and other exchanges do an immense business and exercise a great influence over the trade of the kingdom.

The Chamber of Commerce of New York was established in 1768 and was an important adjunct of the municipal government. At the present time the order in rank as to financial importance of the great metropolitan grain and produce exchanges of the country is about as follows: 1, New York; 2, Chicago; 3, Boston; 4, Philadelphia; 5, Baltimore. The Chicago Board of Trade was organized in 1848, with 82 members. The principal boards of trade in the West in regard to volume of business rank, after the Chicago board, as follows: 1, St. Louis; 2, Milwaukee; 3, Detroit; 4, Cleveland; 5, Toledo; 6, Cincinnati; 7, Buffalo.

The practice of so-called trading on "margins" has grown to be a leading feature of the business of all boards of trade in this country and, to a large extent, also, of those in the Old World. According to this method of dealing, the trader deposits with his broker a sufficient amount to cover the ordinary fluctuations of the security, and the broker furnishes the rest of the necessary capital. For instance, in January the trader wishes to buy 5000 bushels of wheat for delivery in February. If the present price is $1 a bushel, he advances his broker $250, which is a margin of five cents a bushel. If the price of wheat advances, he can order the broker to sell it, and if he chooses, withdraw his margin as well as a profit, according to the extent of the rise. If the price recedes below $.95 or below the point where his margin will cover the loss, he must either deposit enough margin with his broker to cover the falling off or lose what he has advanced.

Most boards of trade have their own clearing houses, and at the end of each business day all parties who have been trading on the board must send reports of sales and purchases to the clearing house. Those whose reports show net loss must send certified checks for the amount, and those who have made net gains are paid. By common consent a basis of grading and inspection of grains and provisions has been established throughout the United States, in which all the boards of trade unite. White winter wheat is divided into Numbers 1, 2, 3 and 4; long red winter into Numbers 1 and 2; hard winter wheat into Numbers 1, 2, 3 and 4; red winter wheat into Numbers 1, 2, 3 and 4, and Colorado wheat into Numbers 1, 2 and 3. There is also the Turkish red winter wheat. Spring wheat is classed as Numbers 1 and 2, northern spring; Numbers 1, 2, 3 and 4, spring; Numbers 1, 2, 3 and 4, white spring, Black Sea and Flinty Fife wheat, and frosted wheat. The same close discrimination is made with regard to corn, oats, rye, barley and all other articles.

The most stringent regulations are made to prevent fraudulent practice on the board. The smallest fraud on the part of any member, however prominent he may be, is punished by immediate suspension, and his trial is prosecuted with a rigid impartiality not surpassed by the courts of law. There is a widespread misunderstanding in regard to transactions on the board, many persons believing that no property is transferred in purchases and sales on margins, whereas the rules of the board not only contemplate the delivery of all property bought and sold on the floor, but express provision has been made therefor, and strict penalties are prescribed for all damages that may arise in case of nondelivery upon the maturity of a contract. A board of trade contract matures on the last day of the term mentioned in it, and all transactions between members for purchases or sales on the floor of the board are strictly contracts under its rules.

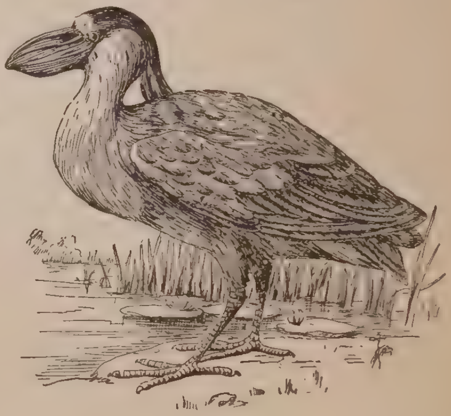
The distinction between so-called *long* and *short* transactions is as follows: In the former, the trader buys, expecting a later advance in price to net him a profit; in the latter, he sells, expecting a subsequent decline.

A *corner* is an artificial scarcity in a commodity, created by a combination organized for the purpose of holding the article affected off the market, in order to extort abnormally high prices. The most memorable attempted wheat corners on the Chicago Board of Trade occurred in May, 1867, when the price of wheat was forced to $2.85; in September, 1888, when wheat sold as high as $2.00; and in May, 1898, when it went to $1.85 on account of the Leiter deal.

In the midst of all the noise and confusion which the outsider observes on the floor of the board during the hours when it is in session, there is a vast and thoroughly systematized volume of business being transacted with a facility and celerity utterly incomprehensible to the uninitiated. The brokers on the Chicago Board of Trade, for example, have a sign language peculiar to themselves, by which they can make themselves understood above the din constantly prevailing. A sign made with the open hand of the broker toward the person he is in communication with, signifies "sell"; if he shows the back of his hand, it means "buy"; one finger raised means 5000 bushels or other units of the article dealt in; two fingers raised signifies 10,000 bushels, and so on. The circular platform or depression where the business is transacted is called the "pit."

Boat, *bote,* a small open vessel or water craft usually moved by oars, though some of them carry a light sail. Boats vary so much in form, dimension and use that it is impossible to describe them. There are many special names applied to special kinds, as, for instance, the punt and dory, flat bottomed boats; cutters, which are narrow and swift, usually with a square-cut stern, including such varieties as dingey, launch, gig and barge; whale boat and lifeboat, sharp at both ends; racing shell, long, narrow and offering the least possible resistance to the water and fitted with sliding seats to give the oarsmen greater power. Since the invention of steam and gasoline engines and electric motors, the making of small motor boats has developed rapidly, and some of these are capable of as high a speed as 40 miles an hour. Every passenger ship is required to carry a number of boats, proportional to its size and to the number of passengers. Among such boats are a longboat, a fully equipped lifeboat and numerous smaller boats, some of which are of canvas and collapsible so that they occupy but little room on the decks. A ship's boats are raised or lowered by derricks or davits which overhang the ship's side. The boats belonging to a ship of war are the launch or longboat, which is the largest, the barge, pinnace, yawl, cutters, jolly-boat and gig. See CANOE; YACHT.

Boat'bill, a South American heron which differs from its relatives in having a broad, heavy bill and rather short legs. The bill itself is not unlike a boat with the keel uppermost, and on the lower side is a pouch in which food can be carried. The boatbill lives in South America and takes its food from the streams, which it watches from an overhanging limb.


BOATBILL

Boat'swain, a warrant-officer in the navy, who has charge of the sails, rigging, colors, anchors, cables and cordage. His office is also to summon the crew to their duties and this he does by a shrill whistle. In the United States navy the boatswain has from $1200 to $1800 a year while in active service, and after he has served ten years he becomes *chief boatswain* and ranks with the *ensigns.* In the merchant service, the boatswain is one of the crew who has charge of the rigging and oversees the men.

Bob'bin, a small spool used for winding yarn or thread. The bobbin is used in spinning; in this operation it is placed on a spindle and the thread is unwound from it as needed. Small bobbins used in lace-making and in sewing machines are made of iron. Bobbins used in spinning have only one head, while those upon which thread is wound for the market have two heads and are called spools.

Bob'olink, in the United States one of the most pleasing of the song birds that nest in the North. The male is a handsome fellow, generally black, but wearing a buff cap, shoulder straps and band across the back. The female, who is dull and streaked with yellow, builds her nest on the ground in the tall grass. She tends the nest, but the male protects her and sings almost without stopping from the tops of brush or high weeds near by. His name is given because his clear notes resemble the word. When the nesting season is over, the bobolink loses his brilliancy and, joining with others of his kind in large flocks, flies to the reeds and marshes of the seacoast and inland waters. Here he becomes very fat, and his flesh is esteemed as the greatest of delicacies. He loses, too, the name of bobolink and is known to the hunters and to epicures as a *reed bird*, or *rice bunting*, when he feeds in the rice fields. Because of its being hunted so much in the South, the bobolink is rapidly disappearing. William Cullen Bryant's *Robert of Lincoln* is a charming and popular little lyric that imitates in part the song of the bobolink.

BOBOLINK

Boccaccio, *bok kah'cho,* Giovanni (1313–1375), an Italian novelist and poet, son of a Florentine merchant. The boy was remarkably precocious and wrote verses before he was seven years of age. Nevertheless, by his father's wish, he spent some years unprofitably in the study of the canon law; he was able to devote himself entirely to literature only after he had taken his degree in law. In 1331 Boccaccio fell in love with Maria, daughter of King Robert of Naples, and his first work, a romantic love tale in prose, *Filocopo*, was written at her command. The *Decameron*, on which his fame rests, consists of one hundred tales, supposed to have been related in ten days by a party of ladies and gentlemen who had withdrawn to a country house near Florence, while the plague was raging in that city. These stories, told swiftly and vividly, are full of wit and beauty, but they are marred by their licentious tone. For this, however, the age, which permitted and even demanded such things, is to blame, rather than Boccaccio himself.

Böcklin, *bök'lin,* Arnold (1827–1901), a Swiss painter. His studies were carried on in Brussels, Paris and Rome. In his later life he spent his time mostly in Germany. His works are original and are attractive because of the fantastic and imaginative subjects and the excellent color-tones. Among his best pictures are *Castle by the Sea, Surprised by Corsairs, Chase of Diana, Venus Reposing, The Isle of the Blessed* and *Sea Idyl.*

Bodleian, *bod'lean,* **Library,** a famous library at Oxford, founded by Sir Thomas Bodley in 1598 and opened in 1602. It claims a copy of all works published in Britain, and for rare works and manuscripts it is said to be second only to the Vatican. It contains over 1,500,000 volumes.

Boehmeria, *böm e'ri ah,* a genus of plants closely resembling the stinging nettle. A number of the species yield tenacious fibers, used for making ropes, twine, net and sewing thread. One species is the Chinese grass, the Malay *ramie*, which is shrubby and three or four feet high. It is a native of China, southeastern Asia and the Asiatic Archipelago, and it has long been cultivated there and in India. The cultivation of certain species of the plant has been introduced into parts of the United States, Algeria, France and other parts of Europe. (See illustration on next page.)

Boeotia, *be o'shah,* in ancient times a division of central Greece lying between Attica and Phocis. The surface is generally level and forms a basin in which lies Lake Copais, into which the Cephissus flows. South of the lake are the famous Helicon Mountains, the seat of the ancient worship of the Muses. The earliest settlers were Pelasgians and Phoenicians. They were conquered in 1124 B. C. by an alien people calling themselves Boeotians. These people organized the Boeotian League, a confederacy consisting of fourteen independent cities with Thebes at its head In the Persian Wars Boeotia sided with Persia, and during the Peloponnesian War it was the bitterest enemy of Athens, though from 456 to 487 B. C. it had belonged to the Athenian League. The Boeotian League was at the height of its power under Epaminondas and Pelopidas and fought desperately against Macedonia. The League was finally dissolved by the Romans in 171 B. C. At present Boeotia forms with Attica a nomarchy of Greece. The Boeotians were always regarded as coarse and stupid, and most of them cared but little for culture.

BOEHMERIA

Boer, *boor,* a Dutch word which means peasant, and which is applied to settlers of Dutch descent in South Africa. See TRANSVAAL COLONY; SOUTH AFRICAN WAR.

Boerhaave, *boor'hah've,* HERMANN (1668–1738), a Dutch physician, born near Leyden. He first took up the study of theology, but gave this up and began at the age of twenty-two the study of medicine. His first work, which was in anatomy, was not of special importance, but later, by his careful and discriminating study, he contributed much to the improvement of that science. In 1701 he was appointed lecturer at the University of Leyden, and here his remarkable methods attracted students from all parts of the world. In 1714 he was made director of the university. He is noted as being the first one to introduce the practice of lecturing to his students at the bedside of his patients, and so was the father of modern clinics. As professor of botany he contributed much to the knowledge of that science and published catalogues of the plants in the garden at Leyden, describing a number of new species. One of his greatest works is *Elements of Chemistry,* which is still of value, though changes have been made in the science be reason of more recent discoveries.

Boer War. See SOUTH AFRICAN WAR.

Bog, a piece of wet, soft and spongy ground, where the soil is composed mainly of decaying and decayed vegetable matter Such ground is valueless for agriculture until reclaimed by drainage, but often yields abundance of peat for fuel or muck for fertilizer. See MARSH.

Bogar'dus, JAMES (1800–1874), an American inventor, born in Catskill, N. Y. Among his inventions were the ring-flyer or ring-spinner used in cotton manufacture, the eccentric mill, an engraving machine and the first dry gas meter. In 1839 he gained the reward offered by the British government for the best plan for carrying out the penny postage system by the use of stamps. Bogardus built the first complete cast-iron structure in the world in 1847, and the first wrought-iron beams were made from his design. His delicate pyrometer and deep-sea sounding machine also were valuable additions to scientific instruments.

Bog Oak, trunks and large branches of oak found imbedded in bogs, and so preserved that the grain of the wood is little affected by the many ages during which it has lain interred. It is of a shining black or ebony color and is frequently converted into ornamental pieces of furniture and smaller ornaments, as brooches, earrings, and the like.

Bogota, *bo go tah',* the capital of Colombia, South America. The location is pleasant and healthful, and the water supply is obtained from mountain streams. Among the important public buildings are those of the university, the capitol, a public library, a museum and the National School of Fine Arts. Bogota is the largest center of internal trade of the country, and it has manufactures of soap, cloth and leather, though these are not of great importance. The city was founded in 1538 and soon became the capital of the province of New Granada. When the Republic of Colombia was established in 1819, Bogota became the capital of the new state. Population, about 100,000.

Bogue, *bohg,* DAVID (1750–1825), the originator of the London Missionary Society. He studied at Edinburgh and was licensed as a preacher of the Church of Scotland. In 1771 he was employed as usher in London, and he afterward became minister of an Independent chapel at Gosport, where he formed an institution for the education of young men for the Independent ministry. He then began the formation of the grand missionary scheme which afterward resulted in the London Missionary Society, and took an active part in the foundation of the British and Foreign Bible Society and the Religious Tract Society.

Bohe'mia, a principality situated in the northwest part of Austria. It is bounded on the n. w. by Saxony, on the n. e. by Silesia, on the s. e. by Moravia and Lower Austria and on the s. by Upper Austria. Its area is about 20,000 square miles, or a little less than that of New Hampshire and Vermont combined.

Bohemia is surrounded by mountains. The surface of the country is in the form of a basin. The central portion contains minor elevations, and the general slope of land is toward the north. The country is drained by the Elbe and its tributaries, the most important of which are the Moldau and the Ager.

The climate is temperate and healthful, the mean annual temperature of the interior being about 49°, with a range varying from 97° to 16°. The higher altitudes are cold, and the summits of the highest mountains are covered with snow during a considerable portion of the year. The rainfall is sufficient for agriculture and is quite evenly distributed.

The country is rich in mineral resources, but mining is not as important an industry as it was in former centuries, since many of the older mines have been exhausted. Extensive deposits of lignite and coal, beds of iron ore and some deposits of copper, cobalt, nickel and antimony exist. There are extensive beds of kaolin of excellent quality, and sand of the highest value in the manufacture of glass also occurs. Coal-mining is the most important of the mining industries.

Agriculture is the leading industry, and it is estimated that 99 per cent of the land is productive. The land is divided into small farms and intensive farming is practiced. The raising of wheat and other cereals, of live stock and poultry, and the cultivation of the sugar beet are the most important of agricultural industries. Silk culture is of some value in the warmest regions, and bee-keeping is profitable. About one-fifth of the country is covered with forests, and in some sections lumbering furnishes occupation for a large number of people.

The manufacturing industries are important and varied. Small factories and the mills of large corporations are found in all parts of the land. Bohemian glass is known throughout the world for its beauty and excellence, and over 50,000 people are engaged in its manufacture. Other important manufactures are beet sugar, malt and distilled liquors, cotton and woolen goods, paper, agricultural implements and machinery. Bohemia is the most important manufacturing province of Austria-Hungary.

Transportation facilities are good. The country is well supplied with railroads, the Elbe furnishes water communication with the sea, the Moldau and other rivers have been canalized and there are numerous canals connecting these streams. The commerce is almost wholly with neighboring European states. The exports are glass and other manufactures, and the imports, raw material and manufactured goods.

The inhabitants are principally Czechs, a branch of the Slavs. Next to these in number are the Germans, and the remainder are Jews. The Germans and Czechs control the social and political life of the country, and both languages are maintained. The school system contains a large number of public schools and the German and Czech universities at Prague. There are also secondary and industrial schools for those who desire to extend their education beyond the primary school.

The province has a local legislature, consisting of an upper and a lower chamber. Members of the former comprise the archbishop of Prague, bishops of the church, rectors of the universities and representatives elected by the large landowners, by chambers of commerce and by rural communities. The lower house consists of members elected by the people. The franchise is restricted by a small property qualification. Most of the inhabitants profess the Roman Catholic faith. The important cities are Prague, the capital, Pilsen and Reichenberg.

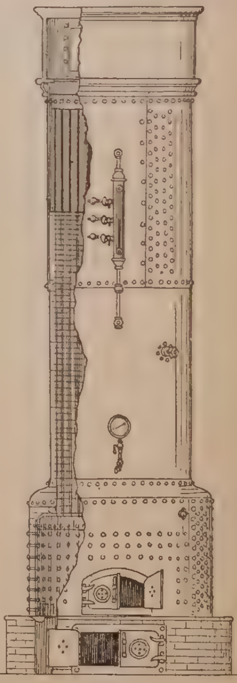
History. Bohemia was first settled by the Boii, who were driven out by the Germans during the first century B. C. In the ninth century Christianity was introduced by the Germans, and soon after this Bohemia became a part of the Moravian kingdom of Svatopluk. From the early part of the tenth century to the fourteenth the country was tributary to Germany, and during this time its interests were greatly advanced. From 1278 to 1305 Bohemia was one of the most powerful kingdoms of Europe and extended its sway from the Elbe to the Adriatic. Soon after this the control passed to the House of Luxemburg, where it remained for more than a century, and several of the kings of Bohemia were emperors of Germany. About 1400 the religious movement inaugurated by John Huss occurred, and this brought on wars which lasted for a number of years, and during which the Czechs were enabled to stay the influence of the Germans. In 1526 the country came under the rule of the Hapsburgs and was thus attached to Austrian territory, since which time it has been under Austrian control. Consult Maurice's *Bohemia from the Earliest Times to 1620.*

Bohemian Forest, a mountain ridge in central Europe, extending from the Fichtelgebirge southward toward the confluence of the Ilz and the Danube rivers, and separating Bavaria from Bohemia. The highest peaks are the Arber (4320 feet) and the Rachel.

Boies, *boiz,* Horace (1827–), an American lawyer and politician, born at Aurora, Erie co., N. Y. He moved to Wisconsin territory in 1844, worked on a farm for six years, later studied law in New York state and was admitted to the bar, beginning practice at Buffalo in 1849. He was elected to the legislature in 1858 as a Republican, but moved in 1861 to Waterloo, Iowa. There he left the Republican party, owing to opposition to a high tariff, and in 1890 was elected governor, being the only Democratic governor of the state since the Republican party was organized. He was a prominent candidate for the Democratic nomination for president in 1896 and was defeated for Congress in 1902.

Boil, a small, painful swelling of a conical shape on the surface of the body. Its base is hard, while its apex is soft and of a whitish color. Boils are generally indicative of depressed health, intemperate habits or disorder of the digestive organs. They are caused by poisonous bacteria, which find their way under the skin. In consequence, the discharges from a boil should be carefully kept from contact with the skin and should be burned with all the cloths used about the diseased part.

Boileau-Despreaux, *bwah lo'da pra o',* Nicholas (1636–1711), a French poet and critic. He studied first for the priesthood, then entered the legal profession, but soon left it to devote himself entirely to literature. In 1660 appeared his first satire on the vice of Paris, and this was followed at intervals by twelve others. In 1664 he wrote his prose *Conversation between the Heroes of Romance,* and his epistles appeared at various times from 1669 onward. His masterpieces were the *Poetic Art,* in which he laid down literary canons, and *Le Lutrin,* published in 1673. In many respects his writings determined the trend of subsequent French poetry, and he left, through his influence upon Dryden, Pope, and their contemporaries, a permanent mark upon English literature.



VERTICAL FIRE-TUBE BOILER

Boil'er, a strong vessel made of iron, steel or copper plates riveted together and used for producing steam under pressure. Boilers are used for supplying engines with steam, warming buildings and for certain manufacturing processes. Since they generate steam under high pressure, the first essential of boilers is that they be of great strength. They are usually of cylindrical form, with ends curving outward. The greatest care is observed in their construction, and strict attention is given to the minutest details of design in order to ensure safety.

The essential parts of a boiler are the *shell,* or envelope; the *flues,* or tubes through which the gases from the fire pass; the *furnace,* which holds the fire; the *grate,* on which the fire is built; the *ash pit,* which is under the grate and receives the ashes, and the *steam dome,* which is on top of the boiler and is used to collect the steam. Large boilers have numerous accessory parts which vary according to the size and pattern of the boiler. Certain accessory parts are necessary to all boilers. Among these are the *safety valve,* which is gauged to blow off when the steam has reached a given pressure; the *water gauges,* which indicate the height of water in the boiler; the *steam gauge* (See GUAGE, STEAM), which shows the pressure of steam, and the *pump* or *indicator,* which supplies the boiler with water.

There are many varieties of boilers, each of which is specially adapted to certain conditions. According to structure, boilers are classified into tubular, flue and water tube boilers, and according to their positions, as horizontal or upright. *Flue* boilers have one or more large flues passing through the interior. The heated gas passes through the flues, which are surrounded by water, thus bringing the heat into contact with all the water at nearly the same time. *Tubular* boilers differ from flue boilers only in having a large number of small tubes instead of one or two large ones. These utilize more heat than the flue boilers and are in general use on locomotives, for stationary engines and for heating large buildings. The *water tube* boiler is constructed so that the water is in tubes which are surrounded by the fire and burning gases. These boilers are considered safer than the old style tubular boiler; they generate steam very rapidly and secure a high pressure; consequently, they are in quite general use where high pressure is required.

Marine boilers and most small boilers used on land are vertical, but large boilers on land are horizontal. The vertical boiler is often convenient because it occupies less space that might be used for other purposes. See STEAM ENGINE.

Boil'ing Point, the temperature at which a liquid boils. The boiling point for water at sea level is 212° F. or 100° C. Ether boils at about 96°, alcohol at about 173° and mercury at 662°. Under the same conditions the boiling point for the same liquid is always the same. The boiling point is raised by increasing the pressure on the surface. Practical application of this principle is seen in cooking meat and vegetables by boiling. A tight cover on the kettle increases the pressure upon the surface of the water and raises the boiling point so that the cooking is accomplished much more quickly. The boiling point is lowered with the decrease of pressure. Since the pressure of the atmosphere is greatest at sea level, the boiling point is lowered with the increase of altitude, and on the high mountains it is so low that vegetables and meat cannot be cooked by boiling in an open kettle. This principle is used in the construction of vacuum pans, which are enclosed vessels connected with air pumps that exhaust the air and vapor from over the surface of the boiling liquid and thus reduce the pressure, making it possible to boil the liquids at a low temperature. This principle can be illustrated by a simple experiment. Take a round-bottom flask or a common soda water bottle, fill it about half full of water, then place it in a kettle of water and gradually bring this to the boiling point. When the water in the bottle has reached the same temperature, remove the bottle, cork it tightly and invert it. Place a damp cloth on it, and upon this pour cold water. The cold water condenses the steam, and the water in the bottle immediately begins to boil. By taking care the water can be made to boil three or four times. Placing salts or other substances in water usually raises the boiling point, while the injection of gases into a liquid usually lowers the boiling point

Bois de Boulogne, *bwah de boo lo'ny',* a pleasant grove near the gates on the west side of Paris, so named after the suburb Boulogne-sur-Seine. Its trees were more or less destroyed during the Franco-German War. It is still, however, one of the pleasantest Parisian holiday promenades and one of the most beautiful parks of the city.

Boise, *boi'ze,* IDAHO, the capital of the state and county-seat of Ada co., on the Boise River and the Union Pacific railroad. It is in an agricultural and mining district and is one of the largest wool markets in the United States. Water is derived from the river for irrigation and for power in manufacturing. Natural hot water gushes forth from a flowing well and is extensively used for heating buildings. Other important institutions are a natatorium, a public library, several academies and a high school, the United States assay office, the state capitol, the penitentiary and a soldiers' home. Boise occupies the site of an old trading post of the Hudson Bay Company and was settled in 1863. Population in 1910, 17,358.

Bojador, *bo zhah dor',* a cape on the west coast of Africa, one of the projecting points of the Sahara, till the fifteenth century the southern limit of African navigation.

Bojol′, one of the Philippine Islands, situated north of Mindanao. It is about 40 mi. long and 30 mi. wide. The surface is mountainous and covered with forests. The most important productions are rice and gold. Population, 187,000.

Bo′ker, George Henry (1823–1890), an American poet and man of letters. He published several volumes of poems, notably war songs, and was the author of the tragedies *Calaynos*, *Anne Boleyn* and *Francesca da Rimini*. In 1871 he became United States minister at Constantinople, and in 1876 he was sent to Saint Petersburg, where he remained for two years. His last literary work, a volume of sonnets, appeared in 1886. Of his war poems the most famous is that of the *Black Regiment*, founded on an incident at Port Hudson in the Civil War.

Bokhara, *bo kah′ra,* a Russian dependency of central Asia, situated between Russian Turkestan and Afghanistan. It has an area of about 100,000 square miles, and a population of 2,500,000. It is bordered on the north by the Hindu Kush Mountains, and on the east by the Bolor Tagh. Most of the region is a level plateau, covered with dry steppes and sandy wastes. The important rivers of Bokhara are the Amu or Oxus, and the Samarcand. The climate is temperate, the rainfall light, and along the banks of the streams the land is fertile. The most important crops are cotton, rice, wheat, barley, fruits, silk and tobacco. The inhabitants are chiefly engaged in raising live stock, especially camels, goats and horses. The manufactures are few and limited. They include silk fabrics, gold and silver ornaments, firearms and sabers. The country has considerable commerce with Russia. The population consists of a mixture of races, nearly all of whom profess the Mohammedan religion. Bokhara was a part of the ancient Bactria and was conquered by Genghis Khan in 1219. About three centuries later it passed under the rule of the Uzbegs. In 1864 it became subject to the Russian authorities and has continued as a dependency of the Russian Empire. The important towns are Bokhara, the capital, and Karshi.

Bolan, *bo lahn′*, **Pass,** a celebrated defile in the Hala Mountains, northeast of Baluchistan, on the route between the Lower Indus (Scinde) and the tableland of Afghanistan. It is about 60 miles long, hemmed in on all sides by lofty precipices, and in parts it is so narrow that a regiment could defend it against an army. It is traversed by the Bolan River. The crest of the pass is 5800 feet high.

Bo′las. See Slings.

Bole, an earthy mineral occurring in uncrystallized masses, and composed chiefly of silica with alumina, iron and occasionally magnesia. It is of a dull yellow, brownish or red color, has a greasy feel and is easily scratched. In ancient times, under the name of Lemnian bole, or earth, one variety of it was used in medicine. At present the best known bole of commerce is a coarse pigment known as Berlin and English red.

Boleyn, *bull′en,* Anne (1501?–1536), second wife of Henry VIII of England. She went to France with Mary, sister of Henry, at Mary's marriage with Louis XII, and on her return to England about 1522, became lady of honor to Queen Catharine. The king, who soon grew fond of her, without waiting for the official completion of his divorce from Catharine, married Anne in January, 1533, having previously created her marchioness of Pembroke. Then Cranmer declared the first marriage void and the second valid, and Anne was crowned at Westminster with unparalleled splendor. In September, 1533, she became the mother of Elizabeth. She was speedily, however, in turn supplanted by her own lady of honor, Jane Seymour. Suspicions of infidelity were alleged against her, and in 1536 the queen was brought before a jury of peers on a charge of treason and impropriety of conduct. Smeaton, a musician, who was arrested with others, confessed, and on May 17 she was condemned to death. The clemency of Henry went no further than the substitution of the scaffold for the stake, and she was beheaded on May 19, 1536. Whether she was guilty or not has never been decided; that she was exceedingly indiscreet is certain.

Bolingbroke, *bol′ing brook,* Henry Saint John, Viscount (1678–1751), a famous English statesman. In 1701 he obtained a seat in the House of Commons, attaching himself to the Tories. He became secretary of war in 1706, retired with the ministry in 1708 and in 1710 became secretary of state for foreign affairs. In 1712 he was called to the House of Lords with the title of Viscount Bolingbroke, and in the following year he concluded the Peace of Utrecht. Queen Anne made Bolingbroke prime minister, but she died a few days later, and Bolingbroke, dismissed by King George, fled to France to escape the inevitable impeachment which he knew would be the result of the Peace of Utrecht. James Stuart, the Pretender, invited him to Lorraine and made him his secretary of state, but dismissed him in 1716, on a suspicion of treachery. In 1723 he was permitted to return to England. He withdrew entirely from politics, spent several years at Battersea and finally returned to France. Pope was indebted to him for suggestions for his *Essay on Man.* He was clever and versatile, but unscrupulous and insincere.

Bol'ivar, Simon (1783–1830), a leader in the South American struggle for independence. He studied law in Madrid, returned to South America in 1809 and in the following year took part in a revolutionary rising in Caracas. In the struggles of New Granada, Venezuela, Bolivia and Peru for freedom from Spanish rule, he was the most prominent man, and when in 1819 New Granada and Venezuela were consolidated into a republic under the name of Colombia, Bolivar was made president. In 1823 he became dictator of Peru, but he held the office only two years. The constitution of Bolivia, which he framed, excited in the minds of his enemies the fear that he wished to make himself perpetual dictator over Colombia, Peru and Bolivia, and he lost some of his influence. The presidency of Colombia he held until a few months before his death.

Boliv'ia, a country of South America, situated between 8° and 22° 50′ south latitude, and 58° and 73° 20′ west longitude. It is bounded on the e. by Brazil, on the s. by Paraguay and Argentina, on the w. by Chile and Peru. Its greatest length is 950 miles, its greatest width is 800 miles, and its area is 729,000 square miles, or a little less than the combined area of Texas, California and Oregon.

Surface and Drainage. The western part of the country is traversed by two parallel ranges of the Andes, which extend from the northwest to the southeast. Of these the eastern range is much the higher, and it contains several peaks exceeding 20,000 feet in altitude. Among the peaks of the western range is the volcano Sajma, which reaches an altitude of 21,000 feet. Between these ranges lies the Bolivian plateau, having an altitude of from 12,000 to 13,000 feet and traversed by a number of small ranges. In this plateau is located Lake Titicaca, which has an elevatian of 12,000 feet (See Titicaca, Lake of). East of the mountains the country consists of a plain which descends by a gradual slope from the foothills to an elevation of about 300 feet at the eastern boundary. The principal rivers traverse this plain, flowing into the Madeira, which waters the northern, and the Paraguay, which waters the southern, part of the country. The largest of these streams are the Bermejo and the Pilcomayo in the south, and the Bene Itenez and Marmore in the north. All of these are navigable.

Mineral Resources. Since its discovery Bolivia has been noted for its mineral wealth. A part of the gold which the Spaniards found in the possession of the Incas was taken from mines of Bolivia, but after the conquest these mines were not worked until the Spaniards enslaved the natives and compelled them to labor, and at no time since the conquest has the output of gold been proportional to the richness of the mines. Silver now constitutes the most important mineral product, and Bolivia ranks fifth among the silver-producing countries of the world. Other important metals are tin, copper, lead and zinc. Valuable deposits of borax and salt also exist, but none of the deposits is yet developed.

Climate. The country has three climatic regions, the warm or semi-tropical region, occupying the lowlands of the east, the temperate region, found in the intermediate altitudes, and the cold region of the mountains and the Bolivian plateau. The rainy season lasts through December, January and February, and during this time rains and hailstorms are of frequent occurrence. The most desirable climatic region is that of the middle latitudes, where the climate is temperate and salubrious. There is in most sections sufficient rainfall for agriculture.

Agriculture. The great plain east of the mountains contains some of the most fertile land in the world; nevertheless agriculture is almost entirely neglected, and the methods employed in cultivating the soil are of the most primitive sort. The land is owned by the indians or by wealthy whites who reside in towns. All work is by the natives and is done by hand labor, and because of the inefficient methods the returns are poor. The chief crops are alfalfa, barley, sugar cane, coffee, cacao, potatoes and cereals. Extensive areas are given to grazing, and large herds of llamas, vicuñas alpacas and sheep, and in some localities horses and cattle, are found. The forests cover large areas, and from them Peruvian bark and rubber are obtained. There are practically no manufactures.

Transportation. The mountain roads are constructed for pack animals only. Carriage roads are few and poor, and nearly all of the merchandise is transported by pack animals. A railway extends from Antofagasta, on the Pacific coast, to La Paz, and another extends eastward and connects with lines from Argentina. The rivers communicating with the Atlantic furnish an outlet for those sections of country through which they flow, but the distance to the seaport is so great that the expense of transportation precludes any extensive traffic. For these reasons the commerce of the country is limited and amounts to about $20,000,000 annually.

Inhabitants and Language. The inhabitants include whites and indians, the latter constituting by far the greater part of the population. The whites are mostly Spaniards and their descendants. The indians are divided between two nationalities, the Quichuas and the Aymaras. The latter are descendants from the Incas, who occupied the territory previous to the Spanish conquest, and live in the high plains to the east of the mountains, where they are engaged in agriculture and in raising live stock. The Quichuas are employed in working the mines and as domestic servants, and some engage in tilling the land. The whites hold all public offices of importance and fill the leading professional and commercial positions. Most of the small tradesmen are known as Mestizos, and are persons of mixed indian and white blood. Spanish is the prevailing language, but the indians maintain their native tongue.

Education. Theoretically the government provides a system of public schools and makes education compulsory, but the laws are not enforced. The schools are entirely inadequate to the demands and are of very poor quality, and a large proportion of the inhabitants is illiterate. A few high schools and industrial schools are maintained, and there are six universities and eight colleges in the country. Schools for the indian children are also maintained by missions of the various churches.

Government. The government is republican in form. The executive power is vested in the president, elected by the people for four years. He is assisted by two vice-presidents, elected in the same way and for the same term, and by five ministers. The legislative department consists of a national assembly of two houses, the Senate and the Chamber of Deputies. The Senate is composed of 18 members, elected for six years, and the Chamber of 64 members, elected for four years. For the purpose of local government the country is divided into eight departments, and each of these is subdivided into provinces and cantons. The courts consist of one Supreme Court and a number of superior and inferior courts. The judges of these are nominated by the Chamber of Deputies and confirmed by the Senate. Nearly all of the inhabitants profess the Roman Catholic faith.

Cities. The important cities are Sucre, the capital, La Paz, Cochabamba and Potozi, each of which is described under its title.

History. Bolivia was a part of the ancient empire ot the Incas. It was conquered by the Spaniards under Pizarro in 1538. During the following century and a half, the Spaniards subdued and enslaved the natives. In 1780 an indian uprising occurred, which caused considerable trouble. The country remained under Spanish rule until 1825, when it gained its independence, organized a republican form of government and adopted a constitution proposed by General Bolivar, for whom the country is named. Since that time Bolivia has been harassed by rebellions and revolutions to such an extent as to paralyze its industries and prevent either social or civic development. As a result of the war in which Bolivia and Peru combined against Chile in 1884, Bolivia was compelled to relinquish the portion of its territory bordering upon the sea, and since that time it has been a land-locked nation. Population, 1908, estimated at 2,268,000.

Bologna, *bo lo'nyah,* an important city of Italy, capital of the province of the same name, 83 mi. n. of Florence. Among the principal buildings are the Palazzo Pubblico, the Palazzo del Podestà, and the church or basilica of San Petronio. Among the hundred other churches are San Pietro, San Domenico, San Giovanni in Monte and San Giacomo Maggiore, all possessing rich treasures of art. The leaning towers, Degli Asinelli and Garisenda, dating from the twelfth century, are among the most remarkable objects in the city. An arcade of 640 arches leads to the church of Madonna di San Lucca, situated at the foot of the Apennines, near Bologna, and is the resort of pilgrims from all parts of Italy. Bologna is one of the great centers of learning in Italy and has long been renowned for its university, founded as early as 1088, and having a library of over 200,000 volumes and 9000 manuscripts. The Academy of Fine Arts has a rich collection of paintings by native artists, such as Francia, and those of the later Bolognese school, of which the Caraccis, Guido Reni, Domenichino and Albano were the founders. The city has important manufactures of silk goods, velvet, chemicals, paper and sausages. Bologna was founded by the Etruscans under the name of Felsina. It became in 189 B. C. the Roman colony Bononia, passed into the hands of the Franks later and was made a free city by Charlemagne in 800 A. D. In the twelfth and thirteenth centuries it was one of the most flourishing of the Italian republics, but the feuds between the different parties of the nobles led to its submission to the papal see in 1514. Several attempts were made to throw off the papal yoke, one of which. in 1831, was for a time successful. In 1849 the Austrians obtained possession of it. In 1860 it was annexed to the dominions of King Victor Emmanuel. Population in 1901, 132,240.

Bologna, University of, one of the most famous universities of the world, situated at Bologna, Italy. The origin of this school is unknown, but some consider it to extend back to 425 A. D., and its continuous existence is known to date from the organization of the law school in the eleventh century. In the fourteenth century a school of theology was added to the schools of law, medicine and liberal arts. The early prominence of the institution was due to the work of Irnerius, who compiled a body of civil law, and also to Gratian, who compiled the body of canonical law. The influence of this work upon the civil and ecclesiastical organization of Europe during the Middle Ages was beyond measure, and the present civil code of Germany is based upon the work of Irnerius. The university also became prominent in scientific investigations and discoveries, and it was here that Galvani made his discovery, which led to what was later known as Galvanic electricity (See Electricity). The university also admitted women as students and at one time had a number of women on its faculty. At present the school maintains departments of philosophy and letters, mathematics and science, jurisprudence, medicine and surgery, pharmacy, veterinary surgery, engineering, drawing and architecture, political science and commercial law. The enrollment is about 1500, and the library contains 170,000 volumes, besides a large number of pamphlets and manuscripts.

Bolognese, *bo lo nyeez'*, **School of Painting.** See Painting.

Bolom'eter, an instrument for detecting and measuring minute quantities of heat. It consists of an electric apparatus known as Wheatstone's Bridge, one arm of which has a small strip of platinum upon the back, and the other arm of which is connected with a sensitive galvanometer. If the platinum arm is exposed to rays of heat, a current of electricity is developed, the strength of which is indicated by the deflection of the needle in the galvanometer. The instrument is so delicate that bringing the hand near the platinum arm will cause a deflection of the galvanometer needle. The bolometer is used in astronomy to measure the heat from the sun and other heavenly bodies. It was by the use of this instrument that the amount of heat received from the moon's rays was determined.

Bolt, a pin, usually of iron or copper, used in fastening together parts of machinery, ships, carriages, stoves and many other structures. The bolt has a head at one end and may be fastened at the other by a key which passes through a slot, or by a nut which turns on a thread. The latter method is the more common. Bolts used in shipbuilding are made of copper, so they will not rust. Screw bolts have a square head and a large thread. They are screwed into the wood and do not have any nut.

Bolton, *bole'ton,* or **Bolton-le-Moors,** a manufacturing town of Lancashire, England, 10 mi. n. w. of Manchester, on the river Croal. The city is divided into two parts. The most important public buildings are the town hall, the market hall and Saint Peter's church. There are six free public libraries and four public parks. Bolton is one of the chief cities in England in the manufacture of cotton goods, and it contains some of the largest cotton mills in the world. There are also numerous foundries, engineering works, chemical works and collieries. The city is one of the oldest in England, being designated as a market town as early as 1256. Population in 1901, 168,205.

Bo'ma, the seat of government of the Kongo Free State, situated on the right bank of the Kongo River, not far from the coast. The town is an important commercial port and contains well built business and residence sections, in the latter of which are found the government buildings. See Kongo Free State.

Bomb, *bom* or *bum*, a large, hollow iron ball or shell, filled with explosive material and fired from a mortar. The charge in the bomb is exploded by means of a fuse filled with powder and other inflammable materials, which are ignited by the discharge of the mortar. Conical shells shot from rifled cannon have supplanted the older bomb. The name bomb is also given to small bales filled with explosives and thrown by hand or laid where they will explode when disturbed. The use of bombs and mortars is said to have been invented in the middle of the fifteenth century.

Bombardier, *bom′bur deer′*, **Beetle,** a small ground beetle which has a remarkable power of discharging at its pursuers an offensive secretion, which burns and leaves a stain like nitric acid.

Bombard′ment, the attack of a fort, city or other field position by continued fire from cannon. Small and unimportant cities are rarely attacked, as it is too expensive a process to be used except in highly important emergencies. Prior to the bombardment of a city, about twenty-four hours' notice is usually given in order that non-combatants may move themselves and their property out of range. The usefulness of bombardment is limited, and its chief function is to drive gunners away and open breaches in walls, so that the infantry may advance. It is quite possible to prevent great loss of life from bombardment, by constructing underground and bomb-proof retreats within the walls. Port Arthur, for example, surrendered only after General Nogi had moved his troops by continued assaults so far forward that they were able to command the whole interior of the Russian fortifications.

Bombay′, a presidency of British India, extends along the west coast from Punjab on the north to about the fourteenth parallel of latitude on the south, and has an area of about 184,000 sq. mi., nearly 123,000 of which are under direct administration of the British government. The surface is mountainous, the Western Ghatz running parallel to the coast for nearly the entire length of the territory. The principal rivers are the Indus, the Tapti and the Nerbudda, all flowing into the Arabian Sea. The climate is hot and, during the rainy season, unhealthful. The soil is fertile, and when the rainfall is sufficient abundant crops are raised; but the northern portion is unproductive, and if the rain fails in any section, a famine usually occurs. The leading agricultural products are cotton, rice, wheat and millet. Bombay is the largest cotton-producing district of India and furnishes nearly one-fourth of the entire crop.

The manufactures are cotton and silk fabrics, leather and brassware. The commerce is extensive, large quantities of cotton being exported. The other important exports are tea, sugar and wool. Most of the trade is with Great Britain and passes through the Suez Canal.

The government is in the hands of a governor and executive council, who hold office by appointment, and the legislative functions are discharged by a legislature consisting of the governor, the executive council and members appointed from the natives and the European residents. For local administration the presidency is divided into four divisions, the Northern, Central, Southern and Sind. There are several native dependencies within the territory, each of which is controlled by a chief, who is subject to the governor of the presidency and is assisted by a British agent residing at his court. The presidency contains 6500 miles of railway, has good schools and an annual revenue of about $75,000.000, which is considerably more than its expenditures. See India.

Bombay (Portuguese, "good harbor"), the chief seaport of the west coast of India, capital of the presidency of the same name. Bombay has many handsome buildings, both public and private, as the cathedral, the university, the library, the secretariat, the new high court and the post and telegraph offices. Various industries, such as dyeing, tanning and metal-working, are carried on, and there are large cotton factories. The commerce is very extensive, exports and imports of merchandise reaching a total value of over $300,000,000 annually. The harbor is one of the largest and safest in India, and there are commodious docks. There is a large traffic with steam vessels between Bombay and Great Britain, besides regular steam communication with China, Australia, Singapore and Mauritius. The island of Bombay, on which the city is situated, is about 11 miles long and 3 miles broad. It was formerly liable to be overflowed by the sea, to prevent which substantial walls and embankments have been constructed. After Madras, Bombay is the oldest of the British possessions in the East, having been ceded by the Portuguese in 1661. Population in 1901, 776,006.

Bombazine, *bom ba zeen′*, a mixed tissue of silk and worsted, the first forming the warp, and the second the weft. It is fine and light in the make, and may be of any color, though black is now most in use. Since 1816 it has been manufactured extensively in Norwich, England.

Bo′na, a seaport and fortified city of Algeria, 85 mi. n. e. of Constantine. Bona was occupied by the French in 1832, since which time it has been much improved. There are manufactures of burnooses, tapestry and saddles, and a considerable trade. The city has one of the best harbors on the African coast. Population in 1901, 32,290.

Bonan'za (Spanish "fair weather" or a "favoring wind"), a term applied in the United States to an abundance of precious metal or rich ore in a mine. It is also applied to any good fortune or successful enterprise.

Bonaparte, *bo'na pahrt*, the French form which the great Napoleon was the first to give to the original Italian name *Buonaparte*, borne by his family in Corsica. As early as the twelfth and thirteenth centuries there were in northern Italy families of this name, members of which received some distinction as governors of cities or envoys. The connection between the Corsican Bonapartes and these Italian families is not clearly established, though probably the former were descended from a Genoese branch of the family, which transplanted itself about the beginning of the sixteenth century to Corsica, an island then under the jurisdiction of Genoa. From that time the Bonapartes ranked as a distinguished patrician family of Ajaccio. About the middle of the eighteenth century there remained three male representatives of this family at Ajaccio, the archdeacon Lucien Bonaparte, his brother Napoleon and the nephew of both, Carlo, the father of the emperor Napoleon I. CARLO or CHARLES BONAPARTE (1746–1785) studied law at Pisa university, and on his return to Corsica, married Letizia Ramolino. He fought under Paoli for the independence of Corsica, but when further resistance was useless he went over to the side of the French and was included by Louis XV among the Corsican families who were to have rights in France as noble. In 1777 he went to Paris, where he resided for several years, procuring free admission for his second son Napoleon to the military school of Brienne. He died at Montpellier. By his marriage with Letizia Ramolino he left eight children: Joseph, king of Spain; Napoleon I, emperor of the French; Lucien, prince of Canino; Maria Anna, afterward called Elisa, princess of Lucca and Piombino and wife of Prince Bacciocchi; Louis, king of Holland; Carlotta, afterward named Marie Pauline, princess Borghese; Annunciata, afterward called Caroline, wife of Murat, king of Naples; and Jerome, king of Westphalia.

Bonaparte, CHARLES JOSEPH (1851–), an American lawyer and politician, born in Baltimore, Md., the grandson of Jerome Bonaparte, king of Westphalia and brother of Napoleon I. He graduated from Harvard and from the Harvard Law School and began practice in Baltimore, attaining distinction in his profession and becoming prominent in many reform movements, especially in civil service reform and in the activities of the National Civic Federation. He became secretary of the navy in 1905.

Bonaparte, JEROME (1784–1860), youngest brother of Napoleon I, born at Ajaccio. He was educated in the college of Juilly, and afterward became a naval lieutenant. He was sent out on an expedition to the West Indies, but the vessel, being chased by English cruisers, was obliged to put in to New York. During his sojourn in America Jerome Bonaparte became acquainted with Elizabeth Patterson and married her in spite of the protests of his brother. Two years later he separated from her at Napoleon's command. After considerable service, both in the army and navy, in 1807 he was created king of Westphalia and was forced to marry Catherine, princess of Württemberg. His government was not wise or prudent, and his extravagance and his brother's increasing exactions nearly brought the state to financial ruin. The Battle of Leipzig put an end to Jerome's reign, and he was obliged to take flight to Paris. He remained faithful to his brother through all the events that followed till the final overthrow at Waterloo. After that, he resided in different cities of Europe, but latterly chiefly at Florence. After the election of his nephew, Louis Napoleon, to the presidency of the French Republic, in 1848, he became successively governor general of the Invalides, a marshal of France and president of the Senate. Of Jerome Bonaparte's first marriage remained one son, Jerome Napoleon; of his second marriage two children remained, Prince Napoleon Joseph, who assumed the name of Jerome, and the Princess Mathilde.

Bonaparte, JOSEPH (1768–1844), the eldest brother of Napoleon I, born in Corsica and educated in France at the college of Autun. He returned to Corsica, in 1785, studied law and in 1792 became a member of the new administration of Corsica, under Paoli. In 1793 he emigrated to Marseilles and married the daughter of a wealthy banker there; and later, with the rise of his brother to fame after the brilliant campaign of Italy, Joseph began a varied diplomatic and military career. At length, in 1806, Napoleon made him king of Naples, and two years afterward transferred him to Madrid as king of Spain. His position there, entirely dependent on the support of French armies, became almost intolerable; he was twice driven from his capital by the approach of hostile armies, and the third time, in 1813, he fled, not to return. After the Battle of Waterloo he went to the United States and lived for a time near Philadelphia, assuming the title of count of Survilliers. He subsequently went to England, and from there to Italy, where he died.

Bonaparte, Letizia Ramolino (1750–1836), the mother of Napoleon I. She was a woman of much beauty, intellect and force of character. Left a widow in 1785, she resided in Corsica till her son became first consul, when an establishment was assigned to her at Paris. On the fall of Napoleon she retired to Rome, where she died.

Bonaparte, Louis (1778–1846), second younger brother of the emperor Napoleon I, and father of Napoleon III; born in Corsica. He was educated in the artillery school at Chalons, accompanied Napoleon to Italy and Egypt and subsequently rose to the rank of a brigadier general. In 1802 he married Hortense Beauharnais, Napoleon's stepdaughter, and four years later, in 1806, was compelled by his brother to accept, very reluctantly, the Dutch crown. He exerted himself in promoting the welfare of his new subjects and resisted as far as possible the tyrannical interference and arbitrary procedure of France; but disagreeing with his brother in regard to some measures of the latter, he abdicated in 1810. From this time on he lived chiefly in Rome and in Florence. He died at Leghorn. He was the author of several works which show considerable literary ability.

Bonaparte, Lucien (1775–1840), prince of Canino, next younger brother of Napoleon I, was born at Ajaccio. He emigrated in 1793 to Marseilles, where he distinguished himself as a republican orator and politician. After receiving an appointment in the commissariat at Saint Maximin, he married Christine Boyer, the daughter of an innkeeper there. After Robespierre's fall he was in some danger, but his brother's influence operated in his favor, and by 1798 he was settled in Paris and a member of the newly elected Council of Five Hundred. Shortly after Napoleon's return from Egypt, Lucien was elected president of the Council, and in this position he contributed greatly to the fall of the Directory and the establishment of his brother's power. In the next year, as Napoleon began to develop his system of military despotism, Lucien, who still held to his republican principles and candidly expressed his disapproval of his brother's conduct, fell into disfavor and was sent out of the way as ambassador to Spain. Eventually, when Napoleon had the consulate declared hereditary, Lucien withdrew to Italy, settling finally at Rome, where he devoted himself to the arts and sciences and lived in apparent indifference to the growth of his brother's power. He came to France, however, and exerted himself on his brother's behalf, both before and after the Battle of Waterloo. Returning to Italy, he spent the rest of his life in leterary and scientific researches. Pope Pius VII made him prince of Canino. He was the author of several works, among which are two long poems.

Bonaparte, Napoleon. See Napoleon I.

Bond, an obligation in writing to pay a sum of money, or to do or not to do some particular thing specified in the bond. The person who gives the bond is called the *obligor*; the persons receiving the bond is called the *obligee.* A bond stipulating either to do something wrong in itself or forbidden by law, or to omit the doing of something which is a duty, is void. No person who cannot legally enter into a contract, such as an infant or a lunatic. can become an obligor, though such a person may become an obligee. No particular form of words is essential to the validity of a bond.

Bonds are of two classes; they are *simple,* where a simple promise is made; *conditional,* where a promise is made to be fulfilled in case a certain other condition is not fulfilled. A common form of bond is that on which money is lent to some company or corporation, and by which the borrowers are bound to pay the lender a certain rate of interest for the money. Government bonds are of this class.

Goods liable to customs or excise duties are said to be *in bond* when they are temporarily placed in vaults or warehouses under a bond by the importer or owner that they will not be removed till the duty is paid on them. Such warehouses are called *bonded* warehouses.

Bone, a hard material constituting the framework of mammals, birds, fishes and reptiles, and protecting vital organs, such as the heart and lungs, from external pressure and injury. In the temperate zones, bones reach their perfection in men between the ages of twenty and twenty-five, and from this age till fifty they change but slightly; after that period they grow thinner, lighter and more brittle. Bones are densest at the surface and, except in the joints, are covered by a firm membrane called the *periosteum,* which helps to nourish the bone. The internal parts of the bone are more cellular, the spaces being filled with marrow, a fatty tissue supporting fine blood vessels. Bone consists of nearly thirty-four per cent animal material and sixty-six per cent mineral substances, chiefly phosphate and carbonate of lime. The animal material may be shown by placing a bone in weak acid, which will dissolve the mineral matter and leave the bone so that it can be easily bent. The animal matter is destroyed by burning, leaving the bone brittle and easily crushed. Bones, from the quantity of phosphates they contain, make excellent manure. The value of bone as manure is increased by boiling out the fat and gelatin, the removal of which makes the bones more readily acted on by the weather and hastens their decay; by the distribution of their parts by grinding them to dust, and by dissolving them in sulphuric acid to render the phosphate soluble in water. Before being utilized in agriculture they are often boiled for the oil or fat they contain, which is used in the manufacture of soap and lubricants.

Bone′-ash, the earthy or mineral residue of bones that have been burned so as to destroy the animal matter and carbon. It is composed chiefly of phosphate of lime and is valuable as a fertilizer.

Boneblack, Ivory Black, or **Animal Charcoal,** a substance obtained by heating bones in close retorts till they are reduced to small, coarse grains, after which the charcoal is reduced to powder by crushing between rollers. Boneblack possesses the valuable property of arresting and absorbing into itself the coloring matter of liquids which are passed through it. Hence it is extensively used in the process of sugar-refining, in which cylinders of large dimensions filled with this substance are used as filters. After a certain amount of absorption the charcoal becomes saturated and ceases to act. It has then to be restored by reheating or other methods. Boneblack has also the property of absorbing odors, and may thus serve as a disinfectant of clothing and apartments.

Boneset, *bone′set,* or **Thor′oughwort,** a useful annual plant, native to America, easily recognized by its tall stem, four or five feet in height, passing through the middle of a large, double, hairy leaf, and surmounted by a broad, flat head of light purple flowers. An infusion of it is much used in domestic medicine as a tonic and for causing perspiration.

Bonham, *bon′am,* TEX., the county-seat of Fannin co., 75 mi. n. e. of Dallas, on the Texas & Pacific and the Denison, Bonham & New Orleans railroads. The city has flour and cotton mills and railroad and wagon shops. It is in an agricultural region and has a large export trade in cotton, grain, flour and live stock. Bonham is the seat of Carleton College (Christian). Population in 1900, 5042.

Bonheur, *bo nor′,* MARIE ROSA (1822–1899), a distinguished French artist and painter of animals. When only eighteen years old she exhibited two pictures, *Goats and Sheep* and *Two Rabbits,* which gave clear indications of talent. Since that time a long list of pictures, *Plowing in Nivernais,* now in the Louvre; *Haymaking* and *The Horse Fair,* most famous of all, now in the Metropolitan Museum of Art, New York, placed there by Cornelius Vanderbilt, who paid $55,000 for it, have made her name famous. In 1865 she was honored by Empress Eugénie, receiving the cross of the Legion of Honor.

Bon Homme Richard, *bo nom′re shahr′,* the flagship of John Paul Jones in his victory over the English sloop *Serapis,* September 23, 1779. With the aid of the French government, Jones had collected a small fleet, and in cruising about the English coast had captured many prizes. September 23, sighting a British fleet of merchantmen under consort of the *Serapis* and the *Countess of Scarborough,* he gave battle. The main contest was between the *Richard* and the *Serapis,* during which Jones lashed the two boats together and precipitated a fearful hand to hand fight. After several hours, the British ship surrendered, but the *Richard* was so badly damaged that she sank. The victory was important in winning foreign respect for the American navy. See JONES, JOHN PAUL.

Bon′iface, the name of nine popes, of whom only three are conspicuous in history. BONIFACE II (530–532) was the first pope to assume the title of Universal Bishop of Christendom. BONIFACE VIII (1294–1303), Bendetto Gaetano, born at Anagni, was the greatest pope of the name. His inauguration was distinguished by unusual pomp and ceremony. In 1296 the pope issued his famous bull *Clericis Laicis,* in which he forbade the payment or collection of taxes on ecclesiastical property without the consent of the Holy See. In 1300 he instituted the Roman Jubilee, and in 1302 he issued the bull *Unam Sanctam*, proclaiming the subjection of the temporal to the spiritual power to be an article of faith necessary to salvation. BONIFACE IX (1389–1404), a native of Naples, successor to Urban VI, acquired almost absolute power in Rome.

Boniface, SAINT (680–755), (original name, Winfrid), a celebrated English missionary, sometimes called the Apostle of Germany, born at Kirton, Devonshire, of a noble Anglo-Saxon family. He labored among the Frisians and German tribes. In 722 he was made bishop and ten years later archbishop. About 743 he founded the Abbey of Fulda, and for ten years, beginning in 744, he was archbishop of Mainz. He is said to have enforced his missionary teaching by cutting down, with his own hands, the sacred oak at Geismar. He was murdered by some barbarians and was buried in the Abbey of Fulda. His festival is celebrated in both the Roman and Anglican churches on June 5th.

Bonito, *bo ne'to,* a name applied to several fishes of the mackerel family, one of which, the bonito of the tropics, or *stripe-bellied tunny,* is well know to voyagers from its persistent pursuit of the flying-fish. It is a beautiful fish, steel blue on the back and sides, silvery on the belly, with four brown longitudinal bands on each side. It grows to a length of two and a half feet and is good eating, though rather dry.

Bonn, an important German town in Rhenish Prussia, situated on the left bank of the Rhine, about 15 mi. s. e. of Cologne. The scenery and surroundings of Bonn are very beautiful and attract tourists from all over the world. The chief buildings are the Münster church, in the late Romanesque style, the Rathaus, the Beethoven House, where the composer was born, and the buildings of the university (See BONN, UNIVERSITY OF). Bonn was long the residence of the electors of Cologne and finally passed into the hands of Prussia by the arrangements of the Congress of Vienna in 1815. Population in 1900, 50,737.

Bonn, UNIVERSITY OF, a university established at Bonn, Germany, in 1818, by Frederick William III, king of Prussia. Next to the University of Berlin, Bonn is considered the leading German university. Its faculties embrace those of theology, law, medicine and philosophy. It has over 2400 students. The library contains 275,000 volumes, besides a large number of manuscripts. The medical department embraces laboratories, a physiological institute and clinics. The university also has a celebrated observatory.

Bon'ner, ROBERT (1824–1899), an American publisher, born near Londonderry, Ireland. He came to the United States when a boy and became a compositor in Hartford, Conn. In 1844 he went to New York; a few years later he purchased the New York *Ledger,* which he brought to a great circulation and influence. He had a fondness for fast horses, although he refused to let them race, and he owned Maud S. and Dexter.

Bonnet-rouge, *bo na'roozh'* (red-cap), a headdress worn during the French Revolution by every one who wished to be considered a true patriot. It was regarded as the emblem of liberty, being called the *cap of liberty.* The name *bonnet-rouge* was also applied to the Revolutionists themselves.

Bon'tebok, an antelope of South Africa, of a brilliant purple-red color, with white markings on the face. It is closely allied to the blesbok.

Bo'ny Pike, a genus of fishes found in North American lakes and rivers, remarkable as being examples of a type of fishes now almost extinct. The body is covered with smooth enameled scales, so hard that it is impossible to pierce them with a spear. The genus includes gar-pike and the alligator-gar of the United States. See GARFISH.

Bonzes, *bon'zez,* the name given by Europeans to the priests of the religion of Fo, or Buddha, in eastern Asia, particularly in China, Burmah, Tonquin, Cochin-China and Japan. They do not marry, but live together in monasteries. There are also female bonzes, whose position is similar to that of nuns in the Roman Catholic church.

Boo'by, a swimming bird, named from the extraordinary stupidity which it shows in lighting on ships and allowing itself to be caught. The booby lives on fish, which it takes by darting down upon them when they are swimming near the surface of the water. Its lower jaw and throat are naked and in one species are colored blue.

Book, as the term is commonly used, a printed composition forming a volume. As the notion of a literary production surviving the materials on which it was written was unknown until long after the invention of writing, it is natural that early writers should have sought to record their thoughts on the most enduring materials at their hands. Thus, the Egyptians engraved their inscriptions on stones, on the walls of their monuments and on columns; the Assyrians pressed theirs upon clay tablets, which were hardened by baking; the Greeks and Romans used tablets of ivory, metal or wood. When tablets of wood were used, they were coated with wax on one side and on this wax, letters were traced with a stylus. Two such tablets, joined together at the back with wires, are the earliest arrangement which resembles the modern book. A raised margin was left around the edge of the wooden tablets to prevent the wax from rubbing.

As people became more advanced and felt greater and more constant need of expressing themselves in writing, a more convenient material was found absolutely necessary, and the papyrus plant of the Egyptians furnished the first flexible writing material of any importance. The papyrus was written on with reeds dipped in gum water colored with soot, and various other decoctions which were used as ink are mentioned by ancient writers. The next material employed was a parchment made from the skins of sheep. The pieces of parchment or papyrus were joined together, when a composition of any length was to be set down, and the entire sheet was wound about a stick in the form of a roll. This was called a *volumen*, and from this comes our word volume. Many of these rolls of papyrus, most of them in a good state of preservation, have been found in the coffins with embalmed bodies in Egypt.

Paper made from cotton came into use about the end of the ninth century and checked the total destruction of old manuscripts, many of which were being erased that the parchment on which they were written might be used again. As linen paper became common in Europe the first real impetus was given to the production of books. The quality of the paper was poor, it was brownish in color and thick and rough, but many of the books produced at this time are marvels of skill and beauty. The writing was all done by hand, and the writers were, for the most part, monks, many of whom spent all of their time in copying. These monks acquired the greatest skill in copying out manuscripts, and some of these it is almost impossible to distinguish from the first printed books. The chapters and paragraphs had elaborate head lines and initials, and the initial letters were often done in red and blue ink or were illuminated in gold. It took a scribe perhaps a year to make a book containing as much reading matter as an average school history, and he could, of course, make only one at a time. If a number of copies of some work were wanted, a reader was sometimes employed, with several scribes to take his dictation. This was a most unsatisfactory method, however, as errors constantly crept in, and it is believed that many of the errors found in the works of the Latin and Greek authors were brought about in this way. As it took so long a time to make books, it is natural that the price should have been very high and that their use should have been confined to the wealthiest classes.

MODERN BOOKMAKING. The greatest impetus which has ever been given to bookmaking was caused by the invention of printing, in the fifteenth century. Books became much cheaper, it was possible for more people to own them, and the art of reading, which had hitherto been almost confined to the clergy and scholars, became practicable and much more common. These earliest books were printed in type which imitated the copyist, and the head lines and capitals were often illuminated by hand with colored inks, as had been done in the written works. In beauty, some of these early printed books rivaled the best productions of modern bookmaking, but in accuracy, of course, they fell far short. Words were written close together, there was no paragraphing or numbering of pages, and abbreviations were so frequent that it finally became necessary to have a book explaining the system of abbreviation.

As previous to the invention of printing the copyists, as has been stated above, were chiefly monks, the works written were mostly of an ecclesiastical nature, and it is natural that the first printed books should have been copies of the Bible and other religious works. Soon, however, these were followed by the works of Latin and Greek authors, at first printed in the original languages, but before long in translations. The sizes of these early printed books were usually quarto or folio, on account of the large type used, and these sizes were determined by the number of leaves made from a sheet of paper. Thus, a sheet folded once made a folio, and a sheet folded twice, a quarto. As all sheets were practically the same size, this designation was comparatively exact, but since different sizes in paper and printing presses have come into use, the designations quarto, octavo and duodecimo mean relatively little. In England the size of books is still expressed in this way, but in the United States the size is usually given in inches.

A book normally consists of the title page, which contains the title, the name of the author and publisher and the date of publication; the preface, a statement by the author, explaining the plan of the work; the table of contents; the text, or subject-matter, and, in some kinds of books, the index. See BOOKBINDING; PAPER; PRINTING; PRINTING PRESS.

Book'binding, the art of fastening together the pieces of a book and enclosing them in a case, called the cover. The first step in binding a book consists in folding the sheets. In small binderies this is done by hand, but in all of the larger establishments it is done by machinery. The separate sheets are fed into the folding machine either by an operator or by automatic feeders. The folder folds and presses the paper in the order necessary to bring the pages opposite one another. The next step consists in arranging the folded sheets, called *signatures,* in order to constitute the book. In large binderies all sheets of the same signature are placed together in piles on a large revolving table, the piles being laid in the order of their numbers, as 1, 2, 3, and so on. Girls sit around this table, and as it revolves each one takes a sheet from each pile as it comes opposite her. In this way by one revolution of the table as many books are placed together as there are girls to collect the sheets. This process is called *gathering.*

After being gathered the sheets are pressed together in a strong press, where they remain for a number of days. After their removal from this press the packages are ready for sewing. The books are creased across by a saw made for the purpose, the book containing from three to five creases, according to its size. Large, strong cords or tapes are fastened in these creases, the ends being left three or four inches long. The leaves are sewed to these cords and in this way the book is fastened together. After sewing, the back is covered with a thick coating of glue and paste. When this is dry, the book is placed in a press resembling a vise, and is hammered to round the back. This press contains boards, over the edge of which the folded edges of the sheets are slightly bent in the hammering, thus forming a ledge in which the cover of the book rests.

The book is now ready for the cover or case. This is put on in two ways. If the book is bound in leather, the boards forming the cover are first fastened to the book. This is done by raveling or scraping the ends of the cords to which the leaves have been sewed and gluing these to the boards. After this the outside cover is pasted on. When this is dry, the edges are folded over and pasted on the inside of the cover. The cover is then lined with white or colored paper, whatever lettering is necessary is put upon the cover and the back, and the book is then placed in press and allowed to dry. If a cloth cover or case is used, this is made complete before it is fastened upon the book. The method of fastening is practically the same as that used with a leather cover, and the finishing is done in the same way.

The edges of the book are treated in various ways. Before the cover is put on, the books are placed in a cutting machine, where the edges are trimmed. These may be left plain, or they may be sprinkled, by placing them under a sieve over which a brush containing coloring matter is drawn; they may be feathered, by dipping them in a tank of water on the surface of which coloring matter has been spread to form the desired pattern, or they may be gilded, which is done by treating the edges with a solution of white of egg and water and then laying on gold leaf. When dry, the gold leaf is burnished and furnishes the beautiful gilt appearance which is seen on many high-priced books. Uncut edges are preferred for many high-priced books. This usually means that the books are trimmed at the ends, but that the front edge of the leaf is left as it was formed by folding.

Styles of binding are denoted by different names. A *leather-bound* book is one which is wholly covered by leather, as an unabridged dictionary or most law books. A *cloth-bound* book is one that has the sides and back covered with cloth. This style of binding is by far the most common and is familiar to every one. A *half-leather* has the back and corners of leather and the boards covered with some other material. The head binding is a cord or tape fastened to the ends of the back for the purpose of giving it strength and improving the appearance of the volume. When such an addition is made it is put on before the cover is fastened to the book.

The hand-made books which were produced before the art of printing was invented were very expensive, and the bindings corresponded with the work on the book. The covers were usually of boards, which were often covered with leather that was highly ornamented, and they were also held in place by metallic hinges bearing engraved designs or other ornaments. Metallic clasps of gold and silver were also often used to fasten the book together, and these might contain rich settings of jewels and other gems. But when the art of printing made books cheaper and more readily accessible, the style of binding was changed accordingly, so as to reduce the price of the book. See BOOK.

Book'keeping, the art or method by which mercantile or pecuniary transactions are recorded and classified. It is of the earliest origin, but in early times was comparatively simple in its principles, the main purpose being to find the balance between debts and credits. In its modern form, it is of two kinds, *single entry* and *double entry.* In the former, debts due to the trader are entered to the debit of the party who owes them, in a book called the *day book,* at the time the transaction is made, while debts incurred by the trader are entered to the credit of the party to whom the debt is owed. At some time the accounts in this book are transferred to the *ledger,* where the account with each person is entered in a separate place, one side being for Dr. (debit) entries and the other for Cr. (credit) entries. To find out the state of the business, it is then necessary to balance the debts owing and the debts owed, and to compare this balance with the stock and cash on hand.

Bookkeeping by double entry gives a much more accurate and complete record of the business. The key to its essential feature is the word *double,* which indicates that every transaction must be entered in two places, in a debit column and a credit column. The books used are a *day book,* a *journal* and a *ledger.* In the day book, details of every transaction are entered as they occur. These amounts are then transferred to the journal, being entered opposite the names or titles of the ledger accounts which are concerned. That item in the day book which has cost something, or which the trader has received, is put in the debit column, and that which produces something, or with which the trader has parted, is placed in the credit column. For instance, if a person has bought a suit of clothes for $15 he would credit cash for $15 and would debit expense $15.

The various items in the journal are then transferred to the ledger, or *posted,* all accounts of the same nature, as clothing accounts, cash accounts, grocery accounts, being placed together and debited or credited according to its nature, as shown by the journal. Thus, on the page marked *Cash* in the ledger, for the transaction noted above, $15 will be entered in the credit column; on the page marked *Expense* $15 will be entered in the debit column. Manifestly, since every item must be posted in some form on both the debit and the credit column of the journal and must be transferred accordingly to the ledger, all the debit items in the ledger must equal all the credit items. An examination to determine whether this is true is known as *taking a trial balance.* This, in a general way, will tell whether the entries have been accurately made. Often other books are used in double entry bookkeeping to afford means of checking particular phases of the business by themselves; such are the *stock book, cash book, bill book, invoice book, account sales book,* each one including entries concerning only its particular subject. For instance, the cash book will show the income and outgo of cash and of nothing more, being retained as an absolutely accurate test of this part of the business.

Book'plate, a printed or engraved label, pasted in or on a book to show its ownership. Such labels were used in the last quarter of the fifteenth century, and were usually hand-painted. Albrecht Dürer originated the engraved bookplate, and the first dated specimen which we have was designed by him in 1516. The designs on these early bookplates usually consisted of the owner's coat of arms, with allegorical elements added. About a half-century after these first bookplates were known in Germany, bookplates were introduced into England, and it is here that they have been most widely used. The first English designs were copied from the German and contained coats of arms and mottoes. These were succeeded by the Chippendale style, which was lighter and more graceful and this in turn by a still simpler design, known as the ribbon and wreath. The first American bookplates came from England and were used by wealthy colonists. Within the last few years much interest has been shown in bookplates, and considerable literature about them has been produced.

Books for Reading. See READING.

Boom'erang, a missile used by the Australian aborigines and by some peoples of India. It is made of hard wood, and is of a peculiar curved shape, sometimes resembling a rude and very open V. The boomerang, when thrown as if to hit some object in advance, instead of going directly forward, slowly ascends into the air, whirling round and round to a considerable height, and returns to the position of the thrower.

If it hits an object, of course it falls. The Australians are very dexterous with this weapon, and can make it go in almost any direction, sometimes making it rebound before striking.

BOOMERANGS

Boone, Ia., the county-seat of Boone co., 43 mi. n. w. of Des Moines, on the Chicago & Northwestern and the Chicago, Milwaukee & Saint Paul railroads. The district contains extensive coal mines and large deposits of fire and pottery clays. The city has shops of the Northwestern railroad, flour mills and an important trade in agricultural produce, live stock and lumber. Population in 1910, 10,347.

Boone, Daniel (1735–1820), a famous American pioneer, born in Bucks co., Pa. Boone's education was limited to reading and writing, but he became skilled in woodcraft, and was the peer of any indian in sagacity and fearlessness. May 1, 1769, at the age of thirty-four, with a company of five other men, he went into the unknown wilds of Kentucky. He built a fort called Boonesboro on the Kentucky River, and thither brought his family and about thirty volunteers. Boone was captured by the indians and carried to Old Chillicothe on the Miami, where he was adopted by a Shawnee chief. Learning of an intended raid upon Boonesboro, he escaped (June 16) and reached home in four days, having but one meal during his journey. He found his family gone, but helped to repel the attack of the indians. In 1780 he again brought his family to Kentucky, and he took a prominent part in the history of the territory till its admission to the Union in 1791. The Battle of "Blue Licks," in which Boone's sons fought by his side, took place in 1782. In the first survey of the state the title to Boone's land was disputed, and in 1795 he moved to Missouri, then a Spanish province. There he received a grant of 8000 acres of land. At the time of the Louisiana Purchase, Boone again lost his land, but Congress granted him 850 acres. The charm of woodcraft clung to him to the last, and in his eighty-second year he went on a hunting excursion. Enoch Boone, his son, was the first white male child born in Kentucky.

Booth, Edwin Thomas (1833–1893), an American actor, son of the English actor, Junius Brutus Booth. He was born at Belair, Md., and made his first stage appearance at Boston in 1849. In his numerous tours in the United States and in Europe he was most enthusiastically received. He was particularly famous for his personation of Shakespearean characters—Othello, Richard III, Lear and Hamlet—and is regarded as the leading American tragedian. He was of unimposing appearance, but was dignified and graceful, with a voice singularly flexible and capable of expressing any shade of meaning or feeling.

Booth, John Wilkes (1839–1865), the assassin of President Lincoln, a brother of Edwin Booth. As an actor he never rose to distinction. He inherited from his father a touch of insanity that rendered his life erratic. During the Civil War his sympathies were for negro slavery, and early in 1865 he formed a conspiracy with others to murder President Lincoln and the principal officers of the government. On the evening of April 14, 1865, he entered Ford's theater, in Washington, where the president was sitting in a private box, and shot him. He shouted "*Sic semper tyrannis*," leaped to the stage below, breaking his leg in the effort, and in the confusion escaped through a back door, mounted a horse that was held in waiting and fled to Virginia. Here he was concealed for a time by sympathizers; but, on being discovered in a barn, he refused to surrender and was shot.

Booth, Junius Brutus (1796–1852), an English actor, the father of Edwin Booth. Before going upon the stage in 1813, he was for a time a printer, then studied law, painting and sculpture. As Iago to Edmund Kean's Othello, he gained great popularity in London, and on his visit to the United States in 1821 he was enthusiastically received. Among his rôles those of Richard III, Lear, Shylock, Hamlet and Sir Giles Overreach were most famous.

Booth, Maud Ballington Charlesworth (1865–), a religious and social reformer, leader of the Volunteers of America, wife of Ballington Booth, general in chief of that organization. She was born near London, the daughter of a wealthy clergyman, but at the age of seventeen she joined the Salvation Army and began at once to work actively in its interest in Paris, and later in Switzerland. In 1887 she married Ballington Booth. They seceded from the Salvation Army in 1896 and founded the Volunteers of America, of which they became directors and leaders. Mrs. Booth was especially successful in her work in behalf of prisoners, both during their confinement and after their release. She also attained a wide reputation as a lecturer and produced several books, of which the best known are *Branded* and *Look Up and Hope.* See VOLUNTEERS OF AMERICA.

Booth, WILLIAM (1829–), general of the Salvation Army, born at Nottingham, England. He was reared in the Episcopal Church, but being converted in a Wesleyan chapel, he joined the Methodist Church and became a minister. He was appointed to hold special evangelistic services in connection with his other work until 1861, when, being requested to settle in the ordinary circuit work, he resigned and began his career as an evangelist proper. In 1855 he married Miss Catherine Mumford, who, in this new departure, proved an able helper until her death in 1890. General Booth organized in London (1865) "The Christian Mission," which grew into the military organization re-christened in 1878 the *Salvation Army.* Under this name that useful organization has spread itself into many parts of the world. It is widely known for the zeal and self-denial of its rank and file. A distinctive feature of the Salvation Army is what has been called "the ministry of all the talents"; that is, giving every convert some part in the work. The *War Cry,* a weekly publication, was established in 1880 and has a wide circulation. General Booth has published many hymns for the use of the army, and it has gone forth "singing itself around the world." In *Darkest England,* published in 1890, General Booth outlines his plans for the suppression of poverty and vice. His sons and daughters have been trained in the work and have been associated with him in the army. Ballington, his second son, after carrying on the work in America for a number of years, withdrew, and in 1896 formed a new organization called the *Volunteers of America,* with headquarters in New York City. See VOLUNTEERS OF AMERICA; SALVATION ARMY.

Booth'ia Fe'lix, the most northerly peninsula of North America, projects between the Gulf of Boothia on the east and McClintock Channel on the west. Its length is 150 miles, and its greatest width is 50 miles At the southern extremity it narrows suddenly to an isthmus, which joins it with the mainland. The peninsula was discovered by Sir John Ross in 1829, and was named for Sir Felix Booth, who was the chief contributor to the expedition. It was on this peninsula that the north magnetic pole was first located in 1831.

Boo'tle, a town of England, in Lancashire, adjoining Liverpool, whose docks extend into the borough. Bootle is in reality a Liverpool suburb. It has extensive timber yards, jute factories, grain mills and foundries. Population in 1901, 58,556.

Boots and Shoes, coverings for the feet. The shoe is one of the oldest articles of apparel. The sandal is the simplest and oldest form of foot protector. It consists of a sole, attached to the foot by a leather thong. Uncivilized races made a shoe of a single piece of untanned hide, which was laced with a thong. From these simple styles more elaborate patterns were developed. The term *shoe* applies to the covering of the foot only, while *boot* means a leather covering for the foot and leg. The Egyptians, Greeks and Romans were familiar with the boot, and highly ornamented designs were often used by the royalty and nobility. Elaborate designs were also common in England during the fourteenth and fifteenth centuries. Those worn by the nobility became so fantastic and expensive that their styles were regulated by the government.

MANUFACTURE. For centuries all shoes were made by hand, and shoemakers came to America with the first colonists. For a long time in New England the shoemaker traveled from family to family and made from such leather as each family had in its possession the shoes desired. When the country became more thickly settled, the shoemaker located in a small shop, and his customers came to him. The man who could make a pair of boots or shoes in a day was considered a first-class workman. The shoemakers then began to employ apprentices. After a time several makers combined their forces and set some workmen to cutting out the pieces for the shoes, others to sewing these together, others to fastening the uppers to the soles. It was found by this division of labor that much more work could be accomplished and in a much more satisfactory manner. Factories were established before any machinery for the manufacture of shoes had been invented.

The first successful machine used in the manufacture of boots and shoes was the rolling machine, which took the place of the old lapstone and hammer for pressing the leather together and giving it a smooth, hard surface. This was followed by a sewing machine, which first sewed together the various parts forming the upper of the shoe. Pegging machines for fastening the soles to the uppers followed. These were of various patterns, first using pegs, then nails and later wire, for sewing, until the present welt machine was invented, which fastens the uppers to the sole in the present fashion.

In no other industry is the division of labor more perfect than in the manufacture of boots and shoes. The ordinary shoe factory consists of three departments. The first is that in which the patterns or pieces are cut, this being done by hand. Next is the department in which the uppers are sewed together. This consists of a room containing a number of sewing machines arranged in line along a table or bench. Each machine does only one thing; one sews a certain seam and another makes button-holes. Thus the pieces pass on from machine to machine, until they pass from the other end of the table ready to be fastened to the sole. The third department is that where the soles are made and the soles and uppers are fastened together. The soles are cut by machinery and are shaped by being placed in heavy presses. The inner sole is then tacked to a *last,* over which the uppers are drawn and fastened to the sole by hand. The outer sole is then tacked on, the last is removed and the shoe is sewed together on the Mackay sewing machine. After this the heel is put on by a machine that presses it into place and fastens it at the same time. The shoes are then sent to the polishing room, where they are finished, and the buttons are put on or the laces put in, as the case may require. They are then packed ready for shipment. Those of the best quality are wrapped in tissue paper, and each pair is packed in a box by itself, but the cheaper grades are packed in cases containing several dozen pairs each.

The New England states lead in the manufacture of boots and shoes, but large factories are found in Illinois and other states of the middle West. The entire output of the country exceeds 220,000,000 pairs each year, and their value is over $261,000,000. American shoes are quite extensively exported to Europe.

Boracic, *bo ras'ik,* **Acid.** See Boric Acid.

Borage, *bur'aj,* a genus of plants having rough, hairy foliage and blue, drooping flowers. One species, a common plant, grows abundantly in waste places in the United States. It is used to give a coolness to beverages, in which its leaves are steeped, and was formerly thought to have the wonderful power of driving away care and making people happy.

Bo'rax, biborate of sodium. Native borax has long been obtained, under the name of *tincal,* from India, the main source being a series of lakes in Tibet. As imported it is in small pieces of a dirty yellowish color and is covered with a fatty or soapy matter. Tincal, which contains various impurities, was formerly the only form in which borax was found. Besides Tuscany, other sources of borax, more particularly in North and South America and in Germany, have been rendered available. America yields large quantities, there being rich deposits of borax and boracic minerals on the Pacific slope, especially in Death Valley. Pure borax forms large, transparent, six-sided prisms, which dissolve readily in water, give off water in dry air, and when heated melt in their water of crystallization, swell up and finally fuse to a transparent glass. Borax has a variety of uses. In medicine it is employed in ulcerations and skin diseases. It has valuable antiseptic and disinfecting properties, and it is now much used for the preservation of meat, fish and milk. It is also employed in soldering metals, and in making fine glaze for porcelain, as it renders the materials more easily melted. It is used in enameling and in making beads, glass and cement.

Bordeaux, *bor do',* one of the most important cities and ports of France, capital of the department of Gironde, on the Garonne, about 70 mi. from the sea and 358 mi. s. s. w. of Paris. In the old town are the Cathedral of Saint André, Saint Michael's church, with its superb front of florid Gothic, the Hotel de Ville and the Palais de Justice. The chief exports are wine and brandy; sugar and other colonial produce and wood are the chief imports. Ship-building is the chief industry, and there are sugar refineries, woolen and cotton mills, potteries, soap works and distilleries. Bordeaux is one of the most flourishing cities of France and ranks, next to Marseilles and Havre, the chief commercial port of France. It is especially noted as a shipping place for wine, which is sent to all parts of the world. By the marriage of Eleanor, daughter of the last duke of Aquitaine, to Henry II of England, Bordeaux was transferred to the English crown, but under Charles VII, in 1451, it was restored again to France. Montaigne and Montesquieu were born in the neighborhood; the latter is buried in the Church of Saint Bernard. Population, 257,000.

Bordelais, *bor de la'*, **Wines,** the wines of the district of Bordeaux, the name of *vin de Bordeaux* being generally given to the wines made in the eleven departments of the southwest of France. The wines of this country are the best which France produces. Their characteristics are fine bouquet, velvety softness on the palate and the faculty of acting beneficially on the stomach without mounting too readily to the head. Besides the red wines of the Bordelais, known under the general name of *claret*, there are also white wines, of which the finest growths are *Sauterne* and *Barsac*. See WINE.

Bor'den, GAIL (1801–1874), an American inventor. Early in life he lived in Covington, Ky., and later in Madison, Ind. In 1822 young Borden went to Mississippi, where he became school teacher, county surveyor and United States deputy surveyor. Later he visited Texas and took charge of the official surveys of that territory. When the Republic of Texas was established, he became the first collector of the port of Galveston and made the first surveys of that city. About 1849 he produced *pemmican* and the *meat-biscuit*. The latter gained him a medal at the World's Fair in London, and he was chosen an honorary member of the London Society of Arts. Unsuccessful financially with his biscuit, he turned his attention to a new scheme and formed the New York Condensed Milk Company, with works at Brewster's Station, N. Y., and Elgin, Ill. This enterprise proved an immense success and Borden amassed a large fortune. Afterward he established an extract-of-beef factory at Borden, Tex., and also produced condensed preparations of tea, coffee, cocoa and various kinds of fruit.

Bor'der, THE, the territory adjacent to the frontier line between England and Scotland, the scene of frequent fights and forays among neighboring clans and families, from the eleventh till the end of the seventeenth century. At present the dividing line consists partly of natural and partly of imaginary outlines from near the mouth of the Tweed to the Solway. The history of the Border warfare is commemorated by Sir Walter Scott in many of his novels.

Borghese, *bor ga'ze*, a Roman family, originally of Sienna, where it held the highest offices after the middle of the fifteenth century. Pope Paul V, who belonged to this family, and who ascended the papel chair in 1605, loaded his relations with honors and riches.

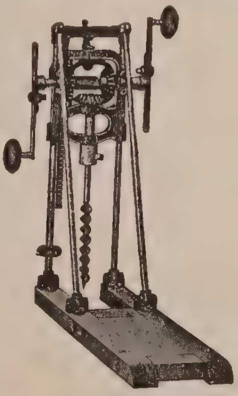
Borghese, CAMILLO, Prince (1775–1832). When the French invaded Italy he entered their service, and in 1803 he married Pauline, the sister of Napoleon. In 1806 he was created duke of Guastalla, and was appointed governor general of the provinces beyond the Alps. After the abdication of Napoleon he broke off all connection with the Bonaparte family and separated from his wife. See BORGHESE PALACE.

Borghese Palace, a magnificent building situated in the midst of the grounds of the beautiful villa Borghese just beyond the walls of Rome. Most of the art collection, consisting of ancient sculpture and painting, belonged originally to the Borghese family of Rome, but was taken to Paris by Napoleon, so that most of the works now contained in the Casino, the name of the building in the villa Borghese, have been gathered together since 1820. The villa and Casino have been purchased by the Italian government and are open to the public. Among the especially noteworthy works of sculpture there are Bernini's *David* and *Apollo and Daphne*. Among the paintings are Domenichino's *Cumaean Sibyl*, Correggio's *Danae*, Titian's *Sacred and Profane Love* and Raphael's *Entombment*, besides masterpieces of many other great painters.

Borgia, *bor'ja*, the name of an Italian family which came into prominence in the fifteenth century. CAESAR BORGIA (1457–1507), son of Rodrigo Borgia, who became pope as Alexander VI, was a cardinal and military leader. By force and by treachery he gained control of the cities of Romagna and endeavored to form an independent hereditary power in central Italy. He was killed while accompanying the king of Navarre in his war against Castile. Though unscrupulous and cruel, Caesar possessed many redeeming qualities. He was a patron of learning, a brave soldier, a shrewd statesman and an eloquent speaker. Macchiavelli holds him up as the type of a model ruler. LUCRETIA BORGIA (1480–1520), duchess of Ferrara, a sister of Caesar Borgia. She was a woman of great beauty and intellectual brilliancy, a patron of learning and the arts. In literature her name was long associated with the grossest crimes, but recent researches of accurate and impartial historians have cleared her memory of the worst charges brought against her.

Bor'ic Acid or **Boracic,** *bor as'ik*, **Acid,** a compound of the element boron with hydrogen and oxygen. Boric acid is found as a salty deposit in some volcanic regions, is a part of many minerals and is contained in the steam which, along with sulphurous vapor, issues from cracks in the soil in Tuscany. The steam from these places is now an important source of the acid, a system of condensation and evaporation being employed. The acid forms white, shining, scaly crystals, which, on heating, melt into a transparent mass that when cooled resembles glass. It dissolves in water and has a slight acid taste; it colors blue litmus purple, and yellow turmeric, brown. The chief use of the acid is as a source of borax, the biborate of sodium.

Bor'ing Machines, machines for piercing wood, leather, metal and rock. The simplest tools for piercing wood are awls, gimlets and augers. The auger used with a brace or bitstock is usually called a *bit.* The tools used for piercing stone and metal are called drills. The simplest boring machines are operated by hand, either by means of a handle or brace, as in case of the auger, or by driving upon the tool with a hammer, as with a drill; but nearly all boring is now done by machines operated by steam or compressed air. These machines work very rapidly and with great power. The most effective is the diamond drill, used in boring rock. This consists of a hollow tube having black diamond teeth at one end. The drill works with a rotary motion and cuts around a circular piece of rock which forms the core. On account of the hardness of the teeth, the drill will withstand great pressure and sinks into the rock rapidly. See Pneumatic Tools.



BORING MACHINE

Bor'neo, the fourth largest island in the world, situated in the Malay Archipelago. It has an area of 306,800 square miles, and a population of 1,700,000. The surface is broken by several chains of mountains running through the interior, the highest summit, near the northern extremity being 13,698 feet high. The rivers are numerous, and several of them are navigable for a considerable distance by large vessels. There are also a few small lakes. The climate is hot, but it is not considered unhealthful. The island is covered with extensive forests of teak and other trees valuable for dyewoods, camphor, gutta-percha, india rubber and various resins and gums. Spices, potatoes, yams, cotton and sugar cane are cultivated. There are some mineral products of importance, consisting of gold, antimony, iron, tin, zinc and coal.

The southwestern, southern and eastern portions of the island are in the possession of the Dutch, under whom are a number of quasi-independent princes. On the northwest coast is the Malay kingdom of Borneo or Bruni. Its chief town, Borneo, is a place of considerable trade and is the residence of the sultan. Sarawak, on the west coast, is under British protection, while Labuan, an island off the northwest coast, is a British colony. Edible birds' nests, trepang, rattan, gutta-percha and timber are the chief articles of export.

Bornu, *bor noo',* a negro kingdom of the Central Sudan, Africa, on the west side of Lake Chad, with an area of about 50,000 sq. mi. The soil is fertile and there are abundant crops of maize, rice, barley, cotton and pulse. The people practice agriculture and also various arts and manufactures. The mai or sultan maintains a standing army, armed with modern weapons. Kuka, the capital, near the western shore of Lake Chad, is one of the greatest markets in Central Africa, a large trade being carried on in horses, the breed of which is famed throughout the Sudan. Another large town, on the shore of the lake, is Ngornu. Population of Bornu, estimated at 5,000,000.

Borodino, *bo ro'de no',* Battle of (called also the Battle of the Moskva), a sanguinary battle fought near the village of Borodino, on the river Moskva, September 7, 1812, between the French under Napoleon and the Russians under Kutusoff, Barclay de Tolly and Bagration. Each side claimed the victory—the Russians, because they retreated in good order and were not pursued; the French, because they remained on the field, and because, shortly afterward, they pressed on to Moscow. The French numbered about 150,000, the Russians, some thousands less; the number of the slain of the two armies amounted to between 70,000 and 80,000.

Bo'ron, one of the chemical elements, not found native but occurring commonly in combinations, such as borax and sassolite. See Boric Acid; Borax.

Borromeo, *bor ro ma'o,* Carlo, Count (1538–1584), a celebrated Roman Catholic saint and cardinal. He improved the discipline of the clergy, founded schools, libraries and hospitals, and was indefatigable in doing good. During the famine of 1570 and the plague in Milan, 1576 he worked with such zeal for the sufferers that the world honors him. A large bronze statue of him stands on the western bank of Lake Mgagiore, near his birthplace.

Boschvark, *bosh'vahrk,* the bush hog or bush pig of South Africa, one of the swine family, about five feet long and with very large and strong tusks. It is the same as the river hog of South Africa. The Kaffirs esteem its flesh as a luxury, and its tusks, arranged on a piece of string and tied around the neck, are considered a great ornament.

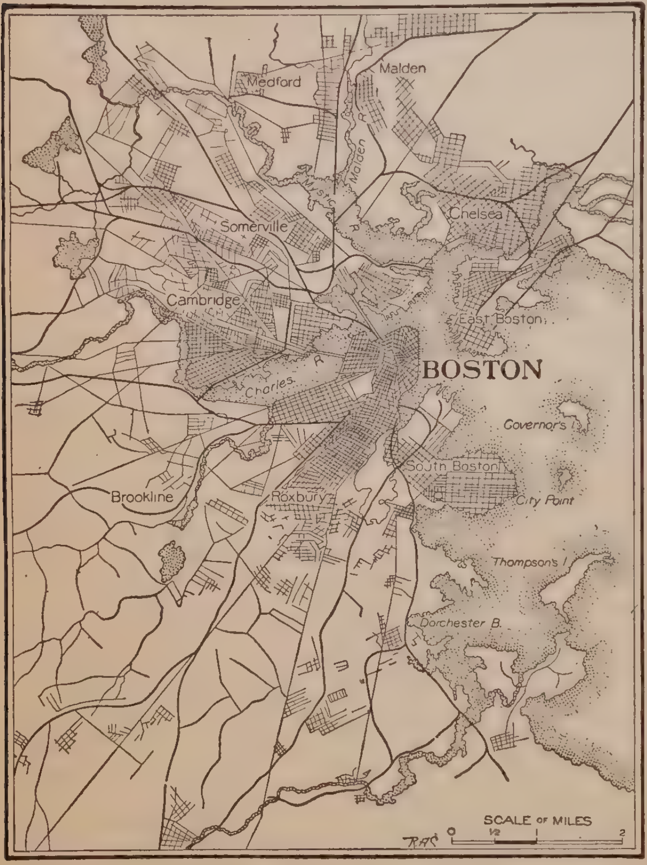
Bosna-Serai, *bos'na sa ri',* or **Serayevo,** the capital of Bosnia, 570 mi. w. n. w. of Constantinople. It contains a *serai,* or palace, built by Mohammed II, to which the city owes its name. It was formerly surrounded with walls, but its only defense now is a citadel built on a rocky height at a short distance east from the town. Bosna-Serai is the chief mart in the province, the center of the commercial relations between Turkey, Dalmatia, Croatia and South Germany, and has, in consequence, a considerable trade, with various manufactures. Population, 41,173.

Bosnia, *boz'ni a,* a province in the northwest of the Balkan Peninsula, w. of Servia. At the close of the Russo-Turkish War in 1878 it was given to Austria-Hungary by the Great Powers, to be held for an indefinite period. Its area, including Herzegovina and Novi-bazar, is 19,700 square miles. The country is level in the north; in the south, mountainous. Its chief rivers are the Save, the Verbas, the Bosna, the Rama and the Drina. About half the area is covered with forests. Tillage is carried on in the valleys and low grounds, maize, wheat, barley, rye, buckwheat, hemp and tobacco being grown. Fruits are produced in abundance. Sheep, goats and swine are numerous. The minerals include coal, which is worked in several places, manganese, antimony and iron. Among the manufactures are iron goods, arms, leather, linens and woolens. The inhabitants are mostly of Slavonian origin and speak almost the same language as that spoken in Servia. They are Mohammedans, Jews, and Roman and Greek Catholics. From the beginning of the fifteenth century until the Russo-Turkish war, 1877–78, Bosnia was subject to Turkey. The Treaty of Berlin, 1878, placed it under control of Austria, and in 1908 it was formally annexed to Austria-Hungary. Population, 1,591,050.

Bosporus or **Bosphorus,** the strait connecting the Black Sea with the Sea of Marmora. It is nineteen miles long and from one-half to two miles wide. A strong current usually flows from the Black Sea to the Mediterranean. The Strait is an important commercial route and is frequented by the vessels of all nations. It is strongly fortified, and the European powers have an agreement that no ships of war shall pass without the consent of Turkey. Over the middle of this channel (about 3,000 feet wide) Darius constructed a bridge of boats on his Scythian expedition (See CONSTANTINOPLE). The *Cimmerian Bosporus* was the name given by the ancients to the strait that leads from the Black Sea into the Sea of Azov. The Bosporus of Constantinople is called the Thracian Bosporus, to distinguish it from the Cimmerian Bosporus.

Bossuet, *bo swa',* JACQUES BENIGNE (1627–1704), a celebrated French pulpit orator, ranking with Massilon, born in Dijon. From the Jesuit College at his home he went to the College of Navarre in Paris, where he devoted himself to the study of philosophy, the ancient classics and the Scriptures. He was made priest, doctor of philosophy and canon of Metz in 1652. Soon after, in a reply to the work of Paul Ferri, a Protestant divine, he became famous as a controversialist, and in 1661 he made an impression on Louis XIV by a sermon in the chapel of the Louvre. His fame spread through France; he was appointed tutor to the dauphin, and in 1681 he was made archbishop of Meaux. In his controversy with Fenelon he had the support of the king and of the pope, but he was not so successful as in his controversy with Ferri. In 1697 Bossuet was made a member of the Council of State, and the following year he became first almoner to the duchess of Burgundy. He never objected to the king's wars, nor to his oppressions, and as a preacher he was not very courageous, nor had he the gift of persuasion. Among his principal works are *Histoire Universelle*; *Oraisons Funebres,* orations on the death of Condé, Turenne and others; and *Histoire des Variations des Eglises Protestantes.*

Bos'ton, the capital of Massachusetts, county-seat of Suffolk co. and chief city of New England, is situated on the western arm of Massachusetts Bay, known as Boston Harbor, 232 mi. n. e. of New York, on the Boston & Maine system, the New York, New Haven & Hartford, the Boston & Albany and other railroads. The oldest part of the city and business center occupies a peninsula between Boston Harbor on the east and Charles River on the west, and is somewhat oval in shape. The entire area of the city is about 38 square miles. The business portion is compactly built, and the streets in this part of the city radiate from Scolly Square, which is near the center of the peninsula, in all directions. The longest streets extend approximately north and south through the peninsula and then turn to the southwest. These are connected by numerous cross streets. Because of the shape of the city, the blocks between the streets are more or less irregular. Washington, Tremont and Summer streets are important business thoroughfares. State Street is the great financial center of the city, and in this respect corresponds to Wall Street in New York. Commonwealth Avenue, Massachusetts Avenue, the Strandway and the Fenway are noted boulevards. Beacon Street is a noted aristocratic center.



Just across the Charles River to the north is Charlestown, noted for the navy yard and as the site of Bunker Hill Monument (See BUNKER HILL, BATTLE OF). The western part of the city, extending to Brookline, which is a very beautiful suburb of Boston, comprises the most fashionable residential portion. It is bounded on the west by the basin of the Charles River and on the east by Boylston Street. Here are found broad streets, regular blocks and elegant residences and public buildings. To the north and east of the city lies East Boston, connected with the business portion by ferry and a double-track tunnel North of East Boston, and just across Chelsea River, is Chelsea. Across Charles River to the west is Cambridge, noted as the seat of Harvard University (See CAMBRIDGE, MASS.). All of the principal streets of the city, as well as its numerous subdivisions, are connected by ample street car lines, and a subway and elevated railway extend through the most crowded portions of the business section.

PARKS AND BOULEVARDS. Of all the parks, the Common is of the greatest interest, on account of its historic associations as well as from its location in the heart of the city. This is an irregular shaped park of less than fifty acres. It is the oldest public park in America and has been used as a pleasure ground since the first settlements were made in and about Boston. Within the Common are found the Soldiers' and Sailors' Monument, the monument to the soldiers who fell in the Boston Massacre (See BOSTON MASSACRE), and the Shaw Memorial, one of the most beautiful monuments in America. Directly south of the Common is the Public Garden, having an area of twenty-four acres, laid out with walks and flower plots and with a pond in the center. At the Arlington Street entrance stands the colossal equestrian statue of Washington, considered to be one of the six great equestrian statues of the world. There are also several other statues, including one of Edward Everett and one of Charles Sumner. Extending from the Public Garden into the fashionable Back Bay district is Commonwealth Avenue, the finest boulevard in the city. Through the center extends a park containing walks, shade trees and statuary, and either side is faced with the finest residences and apartment houses which the city contains. This is crossed by Massachusetts Avenue, which extends across South Bay and connects with the Strandway, a boulevard extending along the water to Marine Park, which includes Castle Island. Just south of Massachusetts Avenue and to the east of Commonwealth Avenue is the Fen district, containing a beautiful park surrounded by boulevards. This system of boulevards adds much to the beauty of the city.

PUBLIC BUILDINGS. Among the most interesting historic structures, the Old Statehouse, on Washington Street at the head of State, is perhaps the most important. The present structure was built in 1748, and it has served in turn as townhouse, courthouse, statehouse and city hall. Within this building were enacted many of the scenes closely related to those events which led to American independence. King's Chapel, at the corner of Tremont and School streets, was established in 1689, and the present structure was completed in 1753. This was the church attended by the royal governors and other officers of the crown during the colonial period. Christ church, which is probably the Old North church of Longfellow's *Paul Revere's Ride,* stands at the north end of Salem Street. It was from the balcony of this church that the signal lanterns were hung which notified Paul Revere of the march of the British. The Old South Meeting House, at the corner of Washington and Milk streets, is one of the most noted historic structures in America (See OLD SOUTH MEETING HOUSE). Faneuil Hall, often known as the "Cradle of Liberty," was first built as a market house (See FANEUIL HALL).

Associated with some of the older buildings and streets are a number of burying grounds of great historic interest. Among these are King's Chapel Burying Ground, containing many quaint old gravestones and the remains of some of the most noted of the early colonists, among them Governor John Winthrop and his son and grandson, the wife of Governor Andros, and John Cotton. Copp's Hill Burying Ground was the second burial place established within the town. It contains the graves of Increase, Cotton and Samuel Mather, Chief Justice Parker and many who were noted for the part they took in the Revolutionary struggle. The Old Granary Burying Ground, on the north side of Tremont Street, between Park and Beacon, is also one of great interest. It contains the remains of many distinguished persons, among them Paul Revere, the Hancock family and Samuel Adams.

The most prominent of buildings which have either been enlarged or modernized is the statehouse, occupying the summit of Beacon Hill near the center of the city, and noted for its immense gilded dome. The statehouse extension, begun in 1890, is of yellow brick with trimmings of white marble, and maintains the old colonial style of architecture. The grounds about the building are beautifully kept and contain a number of monuments of historic interest. Other buildings of note are the city hall, the county courthouse, the Federal building, the customhouse, Boston Athenaeum, which contains a library of 200,000 volumes, the North and South railway passenger stations, the second of which is the largest structure of its kind in the world, and numerous imposing business blocks. The finest architectural center in the city is Copley Square, about which are grouped the public library, Trinity Church and the new Old South Church. These, with the Roman Catholic Cathedral of the Holy Cross, the First Spiritual Temple (Spiritualist) and the First Church of Christ (Scientist) are among the most prominent church edifices in New England. Among the hotels the Adams, the United States, the Parker House, the Quincy House, Young's, the Revere House, the American House, the Thorndyke and the Touraine are well known as commercial hotels, while the Bellevue, the Brunswick, the Copley Square, the Tuilleries, the Vendôme and the Somerset are the leading family and residential hotels. Among the theaters the Boston Theater, with a seating capacity of 3000, is the largest playhouse in New England. Castle Square, Colonial, Columbia, Hollis Street, Keith's, Park's and Tremont are also noted playhouses. Symphony Hall, which is occupied by the Boston Symphony Orchestra for its concerts, is one of the finest music halls in the country. The new Opera House, in the Fenway district, is one of the best in the country.

PUBLIC INSTITUTIONS. Boston has many public institutions which are educational or charitable. First among these is the public library, housed in its magnificent new building on Copley Square. The building is of Milford granite, is rectangular in form and surrounds a court containing a fountain and other beautiful appointments. The interior is noted for its architectural and mural decorations, being probably the finest building in the country in this respect. It houses the largest circulating library in the world, containing about 980,000 volumes. Among the more important educational institutions are Boston University, the Massachusetts Institute of Technology, the Harvard medical school and other departments of Harvard University which are located in the city, and a large number of private and denominational schools. The Perkins Institute and Massachusetts School for the Blind is the most noted school of this sort in the country and one of the most noted in the world (See BLIND, EDUCATION OF THE). Most of the penal institutions of the city are located on islands in the harbor.

COMMERCE AND INDUSTRY. Boston is the commercial and financial center of New England, and next to New York it has the largest foreign commerce. It is the center of the railroad systems of New England, and its passenger traffic is cared for in two great terminal stations, the North Station and the South Station. The South Station, which is over 800 feet long and 700 feet wide, is the largest structure of its kind in the world. The harbor is well protected, deep and safe, eight miles wide and sixteen miles long. The entrances are guarded by strong fortifications and lighted by lighthouses and beacons on the numerous islands. The foreign commerce of the city amounts to about $200,000,000 a year, and three-fifths of this consists in imports. Among the imports wool is an important factor, and Boston is the second wool market of the world. Lines of ocean steamers connect directly with all the leading European ports.

The manufactures are large and varied, and many extensive manufactories are located in surrounding towns, their products finding an outlet through the city. Extensive railroad and insurance interests also have their center here, though many of the enterprises are located in the West.

HISTORY. The first settlement on the peninsula was made in 1626, and in 1630 John Winthrop and a company of colonists removed from Charlestown. Two years later the first meeting house was erected, and three years after this, the first school building. The settlement grew rapidly, and Boston soon became the largest town of Massachusetts Bay Colony, and the center of its educational and religious influence. In the events which led to American independence the city took an active part, and its history during this period is closely interwoven with that of the nation. See BOSTON MASSACRE; BOSTON TEA PARTY; also LEXINGTON, BATTLE OF; BUNKER HILL, BATTLE OF.

After the close of the Revolutionary War, the city advanced rapidly in wealth and prosperity. The first Cunard liner entered her harbor in 1840, and from that time to the Civil War her shipping industries were very important. Boston was one of the leading centers in the antislavery movement, and during the Civil War her citizens stood staunchly by the Federal Union and furnished their full quota of men for the army and navy. Several disastrous fires have visited the city, the most noted being that of 1872, which laid waste fifty acres in the business section. The burnt district was immediately rebuilt on greatly improved plans. Since 1875 the city has grown rapidly, and in the progress many of the old historic structures have been removed to make room for larger and more modern buildings. Boston has done much for the literature and general culture of America. Longfellow, Lowell, Whittier, Emerson, Hawthorne, Holmes, Thoreau, Parkman, Motley and Prescott lived and wrote in or near the city.

POPULATION. In addition to her purely American element, Boston contains many Irish and Italians, with a sprinkling of Germans and English. Population in 1910, 670,585. Consult Lodge's *Boston*, in the Historic Towns series, and Drake's *Old Landmarks and Historic Personages of Boston*.

Boston Mas'sacre, the name given to an affray between a mob of Boston citizens and a squad of seven British soldiers on March 5, 1770. It was the result of the violent opposition of the Bostonians to the stationing of British regulars in the city in time of peace. It occurred on King, now State Street, and resulted in the death of three and the wounding of seven citizens. The soldiers who were responsible were tried for murder and were defended by John Adams and Josiah Quincy and acquitted. The garrison, however, was removed to Castle Island.

Boston Tea Party, the name given to the action of a body of Boston citizens, December 16, 1773. It resulted from the opposition of the colonies to the imposition of a parliamentary tax upon tea. When ships were sent by the English East India Company to various ports in the colonies, the Americans took vigorous action to prevent the collection of the duty. In Boston a body of citizens, disguised as Indians, boarded the vessels and threw 342 chests of Indian tea into the harbor.

Boston University, a co-educational institution established in Boston, Mass., in 1869, under the auspices of the Methodist Episcopal Church. The university includes both college and graduate departments, and has schools of theology, law, medicine and science, and provides post-graduate work in science, language, history and philosophy. The agricultural college is allied with the Massachusetts Agricultural College at Amherst. There are about 150 professors and instructors on the faculty, and the institution has about 1500 students.

Boswell, *boz'wel,* JAMES (1740–1795), the friend and biographer of Dr. Johnson. He was educated at Edinburgh and Cambridge and became a member of the Scottish bar. In 1763 he became acquainted with Johnson, whom he had for some time previous greatly admired. During a year's travel on the Continent he became acquainted with Voltaire, Rousseau and Paoli, and through Paoli he became deeply interested in the cause of Corsican independence. In 1773 Boswell was admitted to the famous club of which Johnson, Burke, Goldsmith and Reynolds were members, and later in the same year he accompanied Johnson on a tour to the Scottish highlands and the Hebrides. An account of the excursion appeared in 1785. During all the time he was with Johnson, Boswell occupied himself with noting down every word and action of his famous companion, and his *Life of Samuel Johnson,* which appeared in 1791, is almost universally admitted to be the best piece of biography in the language. Macaulay has said that Boswell is the first of biographers, not in spite of his littleness, but because of it; and certain it is that if he does not conceal Johnson's faults, he does not hide his own, either. It is because of this masterly biography that we remember Johnson rather as a man than as a writer.

Bosworth, *boz'wurth,* **Field,** BATTLE OF, a great battle fought on the moor two miles south of the English market town of Bosworth, in August, 1485. By this battle the Wars of the Roses were closed, and the earl of Richmond was made king of England in the place of Richard III, who was killed in the battle. See ROSES, WARS OF THE.

Botan'ic Garden, a garden in which plants are cultivated for the purpose of scientific study. Until modern times their sole design was the cultivation of medicinal plants. Modern botanical gardens are usually connected with universities or are under government control. The chief gardens in Great Britain are the Royal Gardens at Kew, near London, and those at Edinburgh, Oxford and Dublin. Of the numerous ones in France, the *Jardin des Plantes* in Paris is the most noteworthy and has probably the largest collection of living plants, some fifteen thousand species growing there. Other famous European gardens are located at Bologna, Strassburg, Munich and Leipzig. In the United States there are many collections of plants, but few bear the name of botanic gardens and none has reached the rank of European establishments. The most extensive and best known are the Shaw Gardens of Saint Louis, now known as the Missouri Botanic Gardens, and kept in connection with Washington University; the botanic gardens at Cambridge; the Arnold Arboretum at Brookline, in connection with Harvard University and the newly established New York Botanical Garden, occupying 250 acres in Bronx Park, New York City.

Bot'any, the science of plants, a very broad study, covering many topics. Modern botany studies plants and their organs, determining their forms and uses. It considers how plants breathe, feed, grow and produce others like themselves. It treats of the classification of plants, of their distribution over the earth, of their relations to one another and of their value to man. From 300 B. C., when Theophrastus, the Greek, began to write upon botany, until the early part of the eighteenth century, when Linnaeus fixed his system of classification, there had been no scientific study of botany, though many plants had been described and much written upon their properties. In the nineteenth century, by the aid of the microscope and other instruments, a natural system of classification was made and is now generally recognized. The later botany has concerned itself principally with the life-history of plants, especially in the lower orders. and here the discoveries and theories of Darwin have revolutionized the beliefs of earlier days, until now all plants are supposed to have descended from a common ancestry (See PLANT). The system of classification (See CLASSIFICATION; GERMS; SPECIES; VARIETY) now generally adopted separates the vegetable kingdom into two great divisions, the first of which contains four groups, and the latter, two. The following outline indicates the characters of these groups:

I. *Cryptogams,* or spore-producing plants.

The plants of this division are classified in the following groups:

1. *Myxothallophytes*, or slime molds, very small organisms, hardly distinguishable from the lowest orders of the animal kingdom. They are one-celled masses of naked protoplasm, resembling the amoeba. See SLIME MOLDS.

2. *Thallophytes*, leafless plants of plainly cellular structure, having no distinction between stem and leaf. Among them are many important groups. See BACTERIA; DIATOM; ALGAE; MOLDS; RUSTS; YEASTS; LICHENS.

3. *Bryophytes*, small, moss-like plants, living a life of two generations, the first in the form of a plant having stem and leaves, and the second in a spore-bearing capsule attached to the body of the preceding generation. See MOSSES.

4. *Pteridophytes*, the most highly organized of the cryptogams, having true roots and often well developed stems and leaves. The life of the plant is in two generations, one being in the form of a large plant with leaves, separate from and independent of the earlier generation. See FERNS; CLUB MOSS.

II. *Phanerogams*, or seed-bearing plants. This division is composed of two classes:

1. *Gymnosperms*, or seed plants with naked ovaries. See CONIFERAE; CYCADS, and many titles of evergreen trees.

2. *Angiosperms*, or seed plants with ovules borne in closed ovaries, living a life of but one generation. There are two subclasses of angiosperms:

(*a*) Monocotyledons, plants in which the embryo has but one cotyledon. The leaves are usually parallel-veined and entire, and the parts of the flower are generally in threes, never in fives. In perennial plants there are no annual rings of wood. See GRASSES; PALMS; LILY FAMILY; ORCHIDS.

(*b*) Dicotyledons, plants in which the embryos have two or more cotyledons. This subclass contains the greater part of the flowering plants. Their stems are composed of bark, wood and pith, and the parts of the flowers are usually in fours or fives (See CRUCIFERAE; LEGUMINOSAE; COMPOSITAE; LABIATAE, a great number of other names of plant families and a great many specific titles). See PLANT.

The standard guide to the identification of plants of the region east of the Mississippi River and north of Tennessee is Gray's *Manual of Botany*. Different authors have prepared similar books for the remaining sections of the country. Goodale's *Physiological Botany* is a standard authority on the structure and use of plant organs. The botanies in use in the public schools usually deal largely with the structure and function of plant organs, but many of them contain simple keys and plant descriptions which will enable pupils to identify many of the specimens that come their way. Among the prominent school texts are Atkinson's *Elementary Botany*, Bergen's *Foundations of Botany*, Bailey's *Botany*, Barnes's *Plant Life* and Coulter's *Plant Relations*. Darwin's *Climbing Plants*, *Forms of Flowers* and *Insectivorous Plants* are interesting to the more advanced student. Besides these, there are an increasing number of books written in a popular vein, each treating of the flora of some restricted locality or especial families or genera of plants; for instance, such is *Flowers and Ferns in their Haunts*, by Mabel Osgood Wright.

Botany Bay, a bay in New South Wales, so called by Captain Cook on account of the great number of new plants collected in its vicinity. The English penal settlement. founded in 1788, and once popularly known as Botany Bay, was formerly located at Port Jackson, some miles to the north.

Botetourt, *bot'e toort*, NORBORNE BERKELEY (1734?–1770), an English colonial governor in America. In July, 1768, he became governor of Virginia, and in May, 1769, he dissolved the assembly for complaining of parliamentary taxation. However, he beseeched the government to desist from its policy; being unsuccessful, he resigned, and died soon after.

Bot'fly, a stout, hairy fly, which lays its eggs upon the hairs of horses' legs. These eggs the quadruped gets into its mouth and stomach, where they quickly hatch, and the larvae, attaching themselves to the walls of that organ, remain a year or two, until they are fully grown. Other species are a prey upon cattle and sheep, boring their way through the skin, under which they remain for some time.

BOTFLY

Both'nia, GULF OF, a gulf forming the northern arm of the Baltic Sea, lying north of the island of Aland and projecting between Finland on the east and Sweden on the west. Its length is 400 miles, its average width about 120 miles and its depth from 20 to 50 fathoms. There are numerous islands on the shores and many small inlets, so that navigation is rather difficult, although there are many good harbors. On account of the large number of mountain streams flowing into it, the waters are comparatively fresh. In winter the gulf freezes over.

Both'well, James Hepburn, Earl of (1536?–1578), known in Scottish history by his marriage to Mary Queen of Scots. It is believed that he was deeply concerned in the murder of Darnley, Mary's husband. He was charged with the crime and was tried, but, appearing with four thousand followers, he was readily acquitted. He was then in high favor with the queen, and, with or without her consent, he seized her at Edinburgh, carried her a prisoner to Dunbar Castle and prevailed upon her to marry him after he had divorced his own wife. A confederacy was formed against him, and in a short time Mary was a prisoner in Edinburgh, and Bothwell had been forced to flee to Denmark, where he died.

Bo'-tree, the pipal, or sacred fig-tree of India and Ceylon, venerated by the Buddhists and planted near their temples. One specimen at Anuradhapura, in Ceylon, is said to have been planted before 200 B. C. It was shattered by a storm in 1887.

Bot'ta, Paul Emile (1802–1870), a French traveler and archaeologist. He discovered the ruins of ancient Nineveh in 1843, while acting as consular agent for the French government at Mosul. As the result of his investigations, he published two important works—one on the cuneiform writing of the Assyrians and the other upon the monuments of Nineveh. The latter is a work of great splendor and marks an era in the investigation of Assyrian remains.

Bött'ger or **Böt'tiger,** Johann Friedrich (1682–1719), a German alchemist, the inventor of the celebrated Meissen porcelain. His search for the philosopher's stone or secret of making gold, led him into many difficulties. At last he found refuge at the court of Saxony, where the elector erected a laboratory for him and forced him to turn his attention to the manufacture of porcelain, resulting in the invention associated with his name.

Botticelli, *bot'te chel'le,* Sandro (properly Alessandro Filipepi) (1447–1515), an Italian painter of the Florentine school. Working at first in the shop of the goldsmith Botticelli, from whom he takes his name, he showed such talent that he was removed to the studio of the distinguished painter, Fra Filippo Lippi. From this master he took the fire and passion of his style, and he added a fine imaginativeness and delicacy of his own. His greatest works are his madonnas, and in these he shows a deep personal feeling and individuality (See Madonna). There is a certain tender and pathetic expression in the faces of all his figures. Some of his best known works are *The Triumph of Spring, Birth of Venus, The Nativity* and *The Adoration of the Magi.* There are many of his pictures in the galleries in Europe, and in the Pitti Florence, and several frescoes are in the Sistine Chapel, Rome. In his later years Botticell became an ardent disciple of Savonarola, and is said by Vasari to have neglected his painting for the study of mystical theology.

Bot'tle, a vessel of moderate or small size, with a neck, for holding liquids. By the ancients bottles were made of skins or leather; they are now chiefly made of glass or earthenware. In bottle-making the glass is blown instead of pressed into form. In smelting, the glass is gathered upon pipes or tubes. When taken from the furnace the ball is rolled upon a slab of iron, the operator blowing through the pipe, meanwhile. This forms a long, hollow, pear-shaped mass, which is then swung into an open mold, the mold closed upon it, and the glass forced into every detail of the pattern by the lungs of the blower. The extra glass above the mold is broken off, the bottle is removed, and the mouth is shaped up by softening in the oven and working with a special tool. It is then sent through the tempering oven. The molds are kept very cool by a blast of air from a large air tube overhead. It is important that the proper amount of glass be gathered for a bottle, otherwise the bottles are too thick or too thin. The lettering on bottles is done by a plate engraved reverse and placed in the mold. In some large factories bottles are made by machines constructed for the purpose. The melted glass passes from the furnace into the machine, which does the work formerly done by workmen. See Glass.

Bot'tle Imp. See Cartesian Diver.

Bot'tle-tree, the name applied to one of several classes of trees, which has a trunk resembling a bottle with bulging sides. The Australian tree is the most common, having a short bottle-like trunk and dense foliage. The natives make nets of the fibers and use the sap in the stem as a drink.

Boucicault, *boo'se ko,* Dion (1822–1890). an Irish dramatic author and actor. He was educated to become an architect, but the success of a comedy, the well known *London Assurance,* which he wrote when only nineteen years old, determined him on a career in connection with the stage. In 1852 be became an actor, and in 1853 he went to America, where he was scarcely less popular than in England. On his return in 1860 he produced a new style of drama, of which *The Colleen Bawn* and *Arrah-na-Pogue* are the best examples. In collaboration with Joseph Jefferson he dramatized Irving's story of *Rip Van Winkle,* in which Jefferson became world-famous as an actor. As an actor Boucicault was clever, but not highly gifted. His dramatic pieces number upward of one hundred fifty.

Boudinot, *boo'de not,* ELIAS (1740–1821), an American patriot and philanthropist, born in Philadelphia. He was admitted to the bar and served in Congress during the Revolutionary War, becoming its president in 1782. Later he resumed the practice of law, but again served in Congress from 1789 to 1795. He was director of the mint in Philadelphia from 1795 to 1805. He was a liberal patron and trustee of Princeton University and gave freely to other educational and religious institutions. He was the founder and first president of the American Bible Society.

Bougainville, *boo gaN veel',* LOUIS ANTOINE DE (1729–1811), a famous French navigator. At first a lawyer, he afterward entered the army and fought bravely in Canada under Montcalm. After the Battle of Quebec, in which Montcalm was killed, Bougainville returned to France and served with distinction in the campaign of 1761 in Germany. In 1763 he undertook the command of a colonizing expedition to the Falkland Islands, but as the Spaniards had a prior claim, the project was abandoned. Bougainville then made a voyage around the world and made a number of discoveries. In the American Revolutionary War he distinguished himself at sea, but he withdrew from naval service after the French Revolution and died in retirement.

Bouguereau, *boo gro',* WILLIAM ADOLPHE (1825–1905), a French painter. He studied painting under Picot and received many honors, becoming a member of the Institute in 1876 and grand officer of the Legion of Honor in 1903. His work has been criticised as being too labored and as lacking in truth to nature. Of his paintings the more important are *The Body of Saint Cecilia Borne to the Catacombs* and *The Birth of Venus.*

Bouillon, *boo yoN',* GODFREY DE. See GODFREY DE BOUILLON.

Boulanger, *boo lahN zha',* GEORGES ERNEST JEAN MARIE (1837–1891), a French soldier. He served in Algeria, Italy and China, fought in the Franco-Prussian War, and became brigadier general in 1880. He was made minister of war in 1886, and in this capacity he was active in procuring the expulsion of the Orleans princes from the army and from France. He successfully contested several seats in the Chamber of Deputies, and in 1889 was elected deputy for Paris by a very large vote. Two months later the government, claiming to have evidence of his intended treason, began a prosecution, and Boulanger fled to Brussels and thence to the Isle of Jersey. He was convicted in his absence and remained an exile. He committed suicide in Brussels, on the grave of a woman to whom he had been deeply attached.

Boulder, *bole'dur,* a rounded, water-worn stone of some size. In geology the term is applied to ice-worn and partially smoothed blocks of large size, lying on the surface of the soil, or embedded in clays and gravels, generally differing in composition from the rocks in their vicinity, a fact which proves that they must have been transported from a distance, probably by ice. When lying on the surface, boulders are known as *erratic blocks.* The *boulder clay,* in which these blocks are found, belongs to the post-tertiary or quaternary period. It occurs in many localities, consists of a compact clay often separated by thin beds of gravel and sand, and is believed to have been deposited from icebergs and glaciers in the last glacial period. See ERRATICS; GLACIERS; TERTIARY PERIOD.

Boulder, COL., the county-seat of Boulder co., 29 mi. n. w. of Denver, on the Union Pacific, the Colorado & Southern and other railroads. It is located at the base of the Rocky Mountains, in an agricultural and stock-raising, as well as a mining district. There are a number of noted gold and silver mines and large smelting works. The city has a large sanitarium and a public park of 1800 acres. It is near the famous Boulder Canyon. Boulder is the seat of the University of Colorado. Population in 1910, 9539.

Boulogne-sur-Mer, *boo'lo'ny'sur mare',* a seaport of France, situated at the mouth of the Liane River and on the English channel, 22 mi. s. w. of Calais and 139 mi. n. w. of Paris. The city is divided into an upper and a lower town. The upper town is surrounded with old ramparts. The lower town is the business section and is modern in its plan and structure. The important buildings are the castle, erected in 1231, the church of Notre Dame, the Hotel de Ville and the palace of justice. The city also contains public baths, a public library and a museum of natural history. The trade and the fisheries are very extensive. Boulogne is one of the most important seaports of France and has daily steamer communication with England. The lower town has quite a large English population, and the English language is quite generally spoken. It is one of the oldest cities of France and still shows evidence of Roman occupation. It was captured by the Northmen in 882, and in 1544 it was taken by Henry VIII of England. It was destroyed by Charles V in 1553. It was here that Bonaparte gathered a large army for the purpose of invading England, but he never carried out his purpose. Louis Napoleon attempted to start an insurrection here in 1840, but he failed and was imprisoned in the castle. Population, about 47,000.

Boulogne-sur-Seine, *boo′lo′ny′sur sayn′*, a town of France in the department Seine, about 5 mi. w. of Paris, of which it is a suburb. It is from this place that the celebrated public park, Bois de Boulogne, gets its name. Population in 1901, 43,851.

Boun′ty, in political economy, a reward or premium granted for the encouragement of a particular species of employment or production, the idea being that the development of such trade or production will be of benefit to the whole community. The term is especially applied to the amount given for the destruction of noxious plants or animals. The same name is given to a premium offered by government to induce men to enlist in the public service, especially to the sum of money given in some states to recruits in the army and navy. During the Civil War in America the bounty was at one time as high as $900.

Boun′ty Jump′ers, a name given to those men who, during the Civil War, enlisted in the Union army in order to secure the bounty which the government was paying and then deserted in order to enlist in another locality and receive another bounty. Stringent measures were taken by the government to put an end to this practice, but without complete success.

Bourbon, *boor′bon,* an ancient French family which has given three dynasties to Europe, the Bourbons of France, of Spain and of Naples. The first of the line known in history is Adhemar, who, at the beginning of the tenth century, was lord of the old province Bourbonnais. The power and possessions of the family increased steadily until, in 1272, Beatrix, daughter of Agnes of Bourbon and John of Burgundy, married Robert, sixth son of Louis IX of France, and thus connected the Bourbons with the royal line of the Capets. Their son Louis had the barony converted into a dukedom and became the first duke of Bourbon. Two branches took their origin from the two sons of this Louis. The elder line was that of the dukes of Bourbon, which became extinct at the death of the Constable of Bourbon in 1527, in the assault of the city of Rome. The younger was that of the counts of La Marche, afterward counts and dukes of Vendôme. From these descended Anthony of Bourbon, duke of Vendôme, who by marriage acquired the kingdom of Navarre, and whose son, Henry of Navarre, became Henry IV of France. Anthony's younger brother, Louis, prince of Condé, was the founder of the line of Condé. There were, therefore, two chief branches of the Bourbons—the royal and that of Condé. The royal branch was divided by the two sons of Louis XIII, the elder of whom, Louis XIV, continued the chief branch, while Philip, the younger son, founded the House of Orleans. The kings of the *elder French royal line* of the House of Bourbon run as follows: Henry IV, Louis XIII, XIV, XV, XVI, XVII (who never obtained the crown), XVIII and Charles X. The last sovereigns of this line, Louis XVI, Louis XVIII and Charles X, were brothers, all of them being grandsons of Louis XV. Louis XVIII had no children, but Charles X had two sons, and it was the younger of these, who was the father of the count of Chambord, who was looked upon by his party as the legitimate heir to the crown of France.

The branch of the Bourbons known as the House of Orleans was raised to the throne of France by the Revolution of 1830, and was deprived of it by that of 1848. A regular succession of princes leads to the notorious Egalité Orleans, who in 1793 died on the scaffold, and whose son, Louis Philippe, was king of France from 1830 to the Revolution of 1848. It is a representative of this branch, Louis Philippe, count of Paris, who is the present head of the family, uniting in himself the claims of both branches to the throne of France.

The Spanish Bourbon dynasty originated when, in 1700, Louis XIV placed his grandson Philip, duke of Anjou, on the Spanish throne, as Philip V. From him is descended the present occupant of the Spanish throne, Alfonso XIII.

The royal line of Naples, or the Two Sicilies, took its rise when, in 1735, the younger son of Philip V of Spain obtained the crown of Sicily and Naples and reigned as Charles III. In 1759, however, he succeeded his brother Ferdinand VI on the Spanish throne, and at that time he transferred the Two Sicilies to his third son, on the condition that this crown should not be united with that of Spain. Ferdinand IV had to leave Naples in 1806; but after the fall of Napoleon he again became king of both Sicilies under the title of Ferdinand I, and the succession remained to his descendants until 1860, when Naples was incorporated into the new kingdom of Italy.

Bourbon, Charles, duke of Bourbonnais (known as the *Constable de Bourbon*) (1489–1527), a famous French general. He distinguished himself at the Battle of Marignano in 1515, but soon afterward he came into disfavor with the king, through the enmity of the king's mother. His anger at the treatment he received from the French led him to make an alliance with the emperor Charles V and Henry VIII of England. At Pavia he aided in the victory of the allies and the capture of the French king. Later he undertook a campaign in Italy, captured Milan and attacked Rome, but during this attack on the city he was mortally wounded.

Bourgeoisie, *boor zhwah zee′*, a name applied to a certain class in France, in contradistinction to the nobility and clergy, as well as to the working classes. It thus corresponds nearly with the English term, "middle classes." The word originally was applied to freemen or burgesses residing in towns.

Bourges, *boorzh*, an ancient city of France, capital of the department of Cher, situated at the confluence of the Auron and Yèvre Rivers, 144 mi. s. of Paris. The most noteworthy building is the Cathedral of Saint Etienne, of the thirteenth century, one of the finest examples of Gothic architecture in France. Bourges is a military center and has an arsenal, cannon foundry and other establishments. There are manufactures of cloth, leather and cutlery. Population in 1901, 39,825.

Bourget, *boor zha′*, Paul (1852–), a French essayist and novelist. He graduated at the Collège de Sainte-Barbe in Paris and then took up journalism. His first publication, with the exception of contributions to magazines, was a volume of verse called *Restless Life*. His *Studies and Portraits* and *Essays on Contemporary Psychology* show him to be a brilliant psychological analyst, and the same trait is strong in his novels. Among his novels are *The Disciple*, *Cruel Enigma* and *The Promised Land*. These, with his other novels, have given Bourget rank with the first of contemporary French novelists.

Bourinot, *boo′re not*, Sir John George (1837–1902), a Canadian historian. After his graduation from Trinity College, Toronto, he established the *Halifax Reporter*, which he conducted for many years. In the proceedings of the Royal Society of Canada appeared his first political and historical papers, which were afterward expanded into books. Among his writings are *Parliamentary Procedure and Practice, Manual of Constitutional History, Parliamentary Government in Canada, How Canada is Governed, Canada under British Rule* and *Canada's Intellectual Strength and Weakness.*

Boutelle, *bow tel′*, Charles Addison (1839–1901), an American statesman, born at Damariscotta, Maine. He went to sea and in 1862 entered the Union navy, serving during the Civil War. In 1870 he became editor and proprietor of the Bangor *Whig and Courier*. He represented his district in congress for nine consecutive terms, from 1883 until his death. As chairman of the House committee on naval affairs he did much toward securing the rebuilding of the navy on the present plan.

Bout′well, George Sewall (1818–1905), an American statesman. In 1842 he was elected as a Democrat to the Massachusetts state legislature, where he sat until 1851. In 1851 and again in 1852, he was elected governor on the Free-Soil ticket. He joined the Republican party in 1854. From 1863 to 1869 he was a member of Congress, was chairman of the committee to report articles of impeachment against Andrew Johnson, and one of the seven managers of the trial. He became secretary of the treasury in Grant's cabinet, which office he held until March, 1873, when he was chosen United States senator. Boutwell was identified with the anti-imperialism movement and was president of the association from 1900 to his death. Mr. Boutwell practiced law in Washington, D. C., and published many valuable essays and books.

Bow, *bo*, the name of one of the most ancient and universal weapons of offense. It is made of steel, wood, horn or other elastic substance. The figure of the bow is nearly the same in all countries. The ancient Grecian bow was somewhat in the form of the letter Σ. In drawing it, the hand was brought back to the right breast, and not to the ear. The Scythian bow was nearly semicircular. The long-bow was the national weapon in England. The battles of Crécy (1346). Poitiers (1356) and Agincourt (1415) were won by this weapon, which was made of yew or ash, of the height of the archer, or about 6 feet long, the arrow being usually half the length of the bow. In England the strictest regulations were made to encourage and facilitate the use of the bow. Merchants were obliged to import a certain proportion of bowstaves with every cargo; town councils had to provide public shooting targets near the town. Of the power of the bow, and the distance to which it will carry, some remarkable anecdotes are related. Thus one writer mentions a random shot of a Turk, which he found to be 584 yards. In the journal of King Edward VI it is mentioned that 100 archers of the king's guard shot at a 1-inch board, and that some of the arrows passed through this and into another board behind it, although the wood was extremely solid and firm. See CROSSBOW.

Bow, in music, the name of that well-known implement by means of which the tone is produced from violins and other instruments of the same kind. It is made of a thin staff of elastic wood, tapering slightly till it reaches the lower end, to which the hairs (about 80 or 100 horsehairs) are fastened, with which the bow is strung. At the upper end is an ornamental piece of wood or ivory, called the *nut,* fastened with a screw, which serves to regulate the tension of the hairs.

Bowdoin, *bo'd'n,* JAMES (1727–1790), an American statesman. He was born in Boston and graduated at Harvard in 1745. He was a member of the general court of Massachusetts (1753–1756) and espoused the patriot cause. In 1774 he was elected a member of the Continental Congress, in 1775 became president of the Massachusetts council and in 1779 presided over the state constitutional convention. In 1785 he became governor of the state and proved his executive ability by his energetic measures in the suppression of Shays's Rebellion. He was a member of the convention that framed the Federal Constitution. Bowdoin was one of the founders, and became the president, of the American Academy of Arts and Sciences, and he was also a founder of the Massachusetts Humane Society. Bowdoin College, Brunswick, Me., was named after him (See BOWDOIN COLLEGE).

Bowdoin College, the oldest institution of learning in Maine, chartered in 1794 and named after James Bowdoin, governor of Massachusetts, of which state Maine was then a district. Connected with Bowdoin College is the medical school of Maine, organized in 1820. The college is noted for the many eminent men who have graduated from it. Among others were Henry W. Longfellow, Franklin Pierce and Chief Justice Melville W. Fuller. The college has about 64 instructors, 450 students, a library containing 94,500 volumes and an endowment of over $900,000.

Bow'ell, MACKENZIE (1823–), a Canadian statesman, born in Suffolk, England. He came to Canada when a boy, and later became editor of the Belleville (Ontario) *Intelligencer.* In 1867 he entered the Dominion Parliament as a Conservative, and served as minister of customs, minister of defense, minister of trade and commerce, and premier. In 1896 Bowell became a leader of his party in the Senate.

Bo'wen, FRANCIS (1811–1890), an American author and lecturer, born in Charlestown, Mass., and educated at Harvard University. He first came into notice as the editor and proprietor of the *North American Review,* which he controlled from 1843 to 1854. He was then chosen professor of natural religion, moral philosophy and civil polity in Harvard University. He was a prolific writer. Among his best-known works are *Principles of Political Economy, Gleanings from a Literary Life* and *A Layman's Study of the English Bible.*

Bow'er-bird, a name given to several different birds living in Australia or the Pacific islands. They are so called because in the nesting season they build remarkable bowers to serve as places of resort. These are constructed on the ground, usually under overhanging branches in secluded parts of the forest. These bowers they decorate with variegated feathers, shells, small pebbles, bones and other things which they gather and bring to this strange amusement hall. Here the male birds meet and dance and go through the queer antics that are supposed to attract their mates. There are different species, each of which has its own peculiar manner of building its bower or decorating it. One uses only small shells for decoration; another bird builds a tent-like structure around a sapling, using for rafters the stems of an orchid that continues to blossom after it is picked. This fondness for bright things is not confined to the bower-birds, though no other birds seem to possess it to so great a degree. The magpie may be mentioned as an American and European illustration of this trait.

Bowles, *bohlz,* Samuel (1826–1878), an American journalist, born in Massachusetts. In 1851 he became editor and manager of the Springfield (Mass.) *Republican,* which had been founded by his father, Samuel Bowles. Under his management it became one of the foremost journals in the United States. Though always interested in public affairs, he never held office, devoting himself to fearless editorial discussion of the issues. As a result of wide travel he published several books, among them *Our Great West* and *The Switzerland of America.*

Bowling, *bo'ling.* Bowls is an ancient British game, still extremely popular. It is played on a smooth, level piece of greensward, generally about 40 yards long, and surrounded by a trench or ditch about 6 inches deep. A small, white ball, called the *jack,* is placed at one end of the green, and the object of the players, who range themselves in sides at the other, is so to roll their bowls that they may lie as near as possible to the jack. Each bowl is *biased* by being made slightly conical, so as to take a curvilinear direction; and in making the proper allowance for this bias, and so regulating the cast of the ball, consist the skill and attraction of the game. The side which owns the greater number of bowls next the jack, each bowl so placed constituting a point, carries off the victory. The modern form of bowling has become very popular in the United States since 1875, and since 1895 has been a well organized and universally recognized sport, especially in the cooler months. It is one of the best of games, in that it brings into play every muscle of the body; does not overtax the strength or develop one organ at the expense of another, and is really a democratic pastime, in which anybody can indulge. It is no longer an outdoor game, but is played on long, narrow platforms, called *alleys,* made very smooth and nearly level, usually of hard wood strips set on edge. The alley shows 60 feet of clear bowling surface, besides the space taken up by the pins at one end and by the player in his run at the other. At each side of the alley is a gutter wide enough so that the balls may fall into it if inaccurately rolled. Beyond the end of the alley is a depression or pit at least 2½ feet wide, and beyond that a swinging cushion to stop the force of the balls. A slanting roadway provides for the return of the balls to the player. The pins, which are of wood, are ten in number and are set up always on exactly the same spots, so as to form a triangle whose apex is in the center of the alley and toward the player. The balls may not exceed 20 inches in circumference nor 16½ pounds in weight, but balls of smaller size and of less weight may be used. In each ball holes are bored for the thumb and finger, so that the ball may be firmly held. The object of the game is to knock down the pins by rolling the ball along the alley. Each player may roll two balls and must then give way to an opponent. Each of these innings is called a *frame.* If a player knocks down all the pins with a single ball, it is known as a *strike*; if he knocks them all down with the two balls, it is known as a *spare.* The count is reckoned on the number of pins knocked down in ten innings or frames. The side having knocked down the most pins, wins. The method of scoring, however, is too technical to describe at length, but it enables the player to count more than once some of the pins he has knocked down. Three hundred is the highest possible score.

Bowling Green, Ky., the county-seat of Warren co , 114 mi. s. w. of Louisville. It is on the Barren River, and on the Louisville & Nashville railroad. It is in a rich agricultural region and has a brisk trade in hay, corn, wheat, oats, tobacco, mules and hogs, while its horse market is one of the most important in Kentucky. Bowling Green is the seat of Ogden College, Potter College for Women, Saint Columbia's Academy and the Western Kentucky State Normal School. During the Civil War it was a point of considerable military importance. Population in 1910, 9173.

Box-el'der, the ash-leaved maple, a small but beautiful tree of the United States. The tree grows rapidly almost anywhere, and accordingly it is a favorite shade tree. The wood is soft and brittle and of little value.

Box'ing, an art which consists in dealing blows with the fist against one's opponent while he protects himself with hands and arms. Boxing was a popular sport among the Greeks and the Romans, and in the gladiatorial contests it became an exceedingly dangerous pastime, for the fists of the combatants were armed with leather covers, which were loaded with iron or lead (See Cestus). In England professional boxers were at one time very common, and during the reigns of the Georges persons of the highest ranks entered these pugilistic combats with great enjoyment. Boxing, however, has fallen into disrepute in more recent years, and prize fights are illegal in England, and both the spectators and principals may be proceeded against in law. In the United States the law varies decidedly. In some states all forms of prize fighting are illegal, while others limit them to a certain number of rounds, and still other states permit such fights under respectable supervision. In some cities all forms of boxing are prohibited, and the general tendency is to restrict the sport entirely to amateurs, who may not box before audiences that pay an admission fee. Nevertheless, the public still takes an interest in boxing, and the newspapers give considerable space to matches between the leading professionals in the numerous classes. Boxing under proper restrictions and reasonable rules is an exercise whose value is recognized by all who understand the art. Gloves thickly padded over the back of the hand, the fingers and the thumb, so as to give the appearance of a very thick mitt, are used. The leather is soft and pliable, and the gloves used by amateurs are so soft that injury is rarely inflicted by the blows. A boxing match usually consists of a specified number of rounds, each lasting three minutes, with an intermission of one minute between rounds. If at any time (except during the last ten seconds of a round) a boxer is knocked down, he is allowed ten seconds in which to get on his feet unassisted. If he fails, he is "counted out" and loses the match. The competitions take place in a *ring*, which is an oblong about 16 by 24 feet, surrounded by two ropes, which make a fence 4 feet high. The regulation athletic costume is used in boxing matches. Boxers are classified according to their weights, the numbers given here being the maximum limit: Bantam weight, 105 pounds; feather weight, 115 pounds; light weight, 135 pounds and under; welter weight, 145 pounds; middle weight, 158 pounds; heavy weight, over 158 pounds.

Box'ing the Com'pass, in seaman's phrase, the repetition of all the points of the compass in their proper order—an accomplishment required of all sailors.

Box Tortoise, *tor'tis*, or **Box Turtle,** a name given to one or two North American tortoises or turtles that can completely shut themselves into their shell, which can be closed by hinged joints in the lower shell.

Box Tree, a shrubby evergreen tree twelve or fifteen feet high, with small oval and opposite leaves, and greenish, inconspicuous flowers, male and female on the same tree. It is a native of England, southern Europe and parts of Asia, and was formerly so common in England as to have given its name to several places —Boxhill, in Surrey, for instance, and Boxley, in Kent. The wood is of a yellowish color, close-grained, very hard and heavy, and takes a beautiful polish. On these accounts it is much used by turners, wood carvers, engravers on wood and mathematical instrument makers. Flutes and other wind instruments are made from it. The boxwood of commerce comes mostly from the regions adjoining the Black and Caspian seas, and is said to be diminishing in quantity. In gardens and shrubberies box trees may often be seen clipped into various formal shapes. There is also a dwarf variety reared as a hedge for garden walks and such places.

Boy'cot'ting, the name given to an organized system of commercial ostracism. It was first employed in connection with the Land League and agitation of 1880 and 1881 in Ireland. It took its name from Captain James Boycott, a Mayo landlord, against whom it was first put in force. Persons who are subjected to boycotting find it difficult or impossible to get any one to work for them, to supply them with the necessaries of life or to associate with them in any way. The practice has been legislatively declared illegal in many states of the Union.

Boy'dell, JOHN (1719–1804), an English engraver, chiefly distinguished as an encourager of the fine arts. He engaged Reynolds, Opie, West and other celebrated painters to illustrate Shakespeare's works, and from their pictures was produced a magnificent volume of plates, the Shakespeare Gallery. The work of British engravers, through his influence, came to attain such excellence that it was sought after all over Europe.

Boy'esen, HJALMAR HJORTH (1848–1895), a Norwegian-American author. He came to the United States in 1869 and became editor of a Scandinavian journal in Chicago. He was professor of German at Cornell University from 1874 to 1880 and filled a similar post at Columbia University, New York. He published *Gunnar* and other novels, *Idyls of Norway* and many translations from the Scandinavian tongues.

Boyle's Law, otherwise called Mariotte's Law, a law in physics, to the effect that the volume of a gas at a constant temperature will vary inversely as the pressure to which it is subjected. A given volume of gas under a pressure of two pounds to the square inch will occupy twice the space it will under a pressure of four pounds to the square inch.

Boyne, a river of Ireland, which rises in the Bog of Allen, and after a course of 60 miles falls into the Irish Sea 4 miles from Drogheda.

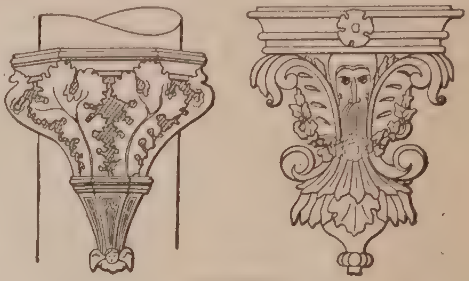
Boy Scouts, an organization for boys planned by General Robert Baden-Powell of England, and having for its purpose character-building for boys between 12 and 18 years of age. The Boy Scouts of America were organized by Ernest Thompson-Seton and the movement has spread rapidly. The method is summed up in the term *Scout-craft.* Scout-craft consists of First Aid, Life Saving, Tracking, Signaling, Cycling, Nature Study, Seamanship and other instruction. This is accomplished in games and team play, and is pleasure, not work, for the boy. Before he becomes a scout a boy must take the scout's oath, thus: "On my honor I promise that I will do my best; (1) To do my duty to God and my country; (2) To help other people at all times; (3) To obey the Scout Law."

Bozeman, *boze'man,* MONT., the county-seat of Gallatin co., 96 mi. s. e. of Helena, on the Gallatin River and the Northern Pacific Railroad. The city is the business center for a large agricultural and stock-raising district, and it is near deposits of coal, gold, silver and iron. Four large canals and many smaller ones supply water for irrigating the valley, which produces large crops of grain. The industrial establishments include flour mills, stone quarries, brickyards, lumber mills, breweries and other works. The state college of agriculture and mechanic arts is located here. Population in 1910, 5107.

Bozzaris, *bo'tsah ris,* MARCO (1788–1823), a Greek hero of the War of Independence. He distinguished himself by his patriotism and military skill. He was killed in a night attack upon the camp of the Pasha of Scutari. The incident gave rise to the poem *Marco Bozzaris* by Fitz-Greene Halleck.

Brabant, *brah'bant,* the central district of the lowlands of Holland and Belgium, extending from the Waal to the sources of the Dyle, and from the Meuse and the plain of Limburg to the lower Scheldt. In the time of Caesar, Brabant was inhabited by a mixed race of Germans and Celts, but in the fifth century the Franks took possession of it. Later it became a part of the Duchy of Lorraine. The principality of Brabant grew up around the city of Louvain. In 1430 Brabant came under the rule of the House of Burgundy and later passed to the Hapsburgs. The northern part of Brabant took part in a revolt of the Netherlands against Philip II of Spain and became a part of the Dutch Republic. After the wars of Napoleon all of Brabant was included in the kingdom of the Netherlands and was divided into three provinces.

Brack'et, a projection from a wall or other surface, used to support balconies, windows or upper portions of a building. Brackets are generally made of iron, wood or metal and are sometimes elaborately designed and ornamented. The term is also applied to the small supports of shelves, statues and the like. See CORBEL.



BRACKETS

Brad'dock, PA., a borough in Allegheny co., 10 mi. e. of Pittsburg, on the Monongahela River and on the Pennsylvania, the Baltimore & Ohio and other railroads. It has extensive manufactures of steel rails, wire, cement, plaster and other articles. The town has a Carnegie public library. It was settled about 1795, on the site of General Braddock's defeat in 1755. Population in 1910, 19,357.

Braddock, EDWARD (1698–1755), a British soldier. In 1754 he was made commander of all British troops in America. He arrived at Hampton, Va., in 1755, and near Alexandria met the Virginia troops for the expedition against the French Fort Duquesne. By April 24 he had reached Frederick, Md., when he was forced to wait for wagons to transport his stores. He was joined there by Washington, whom he invited to be his aid-de-camp, and Benjamin Franklin, then postmaster general of the colonies. He scorned the advice of Franklin regarding the danger from the ambuscades of the indians, and set out from Fort Cumberland by the path marked out by Washington two years earlier. The army consisted of about twelve hundred regulars and provincials and a few friendly indians. On July 9 the advance division under Gates was attacked by a band of French and indians. Frightened by the war-whoop which they heard for the first time, the British fell back in confusion, and Braddock tried to rally them against their invisible foes.

Familiar with indian warfare, the Virginians separated, and sought shelter behind rocks and trees, but Braddock, dispensing with the "military instruction of a Virginia colonel," Washington, kept his men drawn up in platoons, and they fired at random into the forest, killing many of the Americans. Braddock's personal bravery was conspicuous. Five horses were killed under him, and he was at last mortally wounded. The battle ended in a rout, and less than half of the force survived and was led to safety by Washington.

Brad'ford, a city of England situated on the Aire, 8 mi. w. of Leeds The town is divided into the old and new sections. The latter has been almost entirely rebuilt since 1860, and it contains wide and well constructed streets, with modern buildings. The most important structures are the town hall, Saint George's Hall, Mechanics' Hall, the exchange and the temperance hall. The city contains a technical college, a free public library and numerous other educational institutions. There are also an infirmary, an eye and ear hospital, an institution for the blind and several almshouses. The city has a number of public parks and is noted for its excellent public utilities, including the water, gas and electric light works, which are owned by the municipality. Its leading manufactures are worsteds, alpacas and mohairs. It also manufactures silks and velvets and cotton goods. The town was incorporated in 1847 and was made a city in 1897. Population in 1901, 279,809.

Bradford, Pa., a city in McKean co., 76 mi. s. of Buffalo, N. Y., on a tributary of the Allegheny River, and on the Pennsylvania, the Erie, the Buffalo, Rochester & Pittsburg and several other railroads. It lies in a productive oil field and in a natural-gas region, and has oil refineries, tool shops, boiler and gas engine works, glass works, extensive lumber interests and immense wood-working establishments. Near the city are vitrified, pressed and enameled brick, and acid and wood-alcohol works. Fourteen miles away is the great Kinzua bridge, 300 feet high and 2100 feet long Population in 1910, 14,544.

Bradford, William (about 1590–1657), a colonial statesman in America, second governor of Plymouth colony and the chief historian of that colony and period. He was born in Yorkshire, England, joined the Separatist Church at Scrooby, but was imprisoned when that congregation went to Holland in 1608. Later he joined his friends at Leyden and became a prominent member of the community there. He went to America on the *Mayflower*, and upon the death of Carver he became governor of the colony, holding the office continuously until his death, with the exception of a period of five years. During all this time he was the responsible head of the colony and administered its affairs with remarkable foresight and sagacity. His *History of Plymouth Plantation* is the foundation for all later accounts of the period.

Bradlaugh, *brad'law,* Charles (1833–1891), an English politician and reformer. He is well known by his writings and lectures, and more especially by his efforts to gain admission to Parliament. Being elected for Northampton in 1880, he claimed the right to make affirmation instead of taking oath, as he was an atheist; and although he offered later to take oath, this right was denied him. Though he was repeatedly reëlected by the same constituency, the majority of the House of Commons continued to declare him disqualified for taking the oath or affirming; and it was only after the election of a new Parliament in 1885 that he was allowed to take his seat without opposition.

Brad'ley, Joseph Philo (1813–1892), an American jurist, born at Berne, N. Y., and educated at Rutgers College. He was admitted to the bar in 1839, attained prominence in his profession and was a Republican elector in the Fremont campaign of 1856. In 1870 he was appointed associate justice of the Supreme Court, and in 1876 he was a member of the electoral commission which decided the election in favor of President Hayes. He was one of the most distinguished constitutional lawyers of his time.

Brad'shaw, John (1602–1659), an English judge, president of the court which tried and condemned Charles I. After the death of the king he opposed Cromwell and the Protectorate, and he was in consequence deprived of the honors which had been given him for his conduct of the trial. On the death of Cromwell he became lord president of the council. At the Restoration, his body was exhumed and hung on a gibbet with those of Cromwell and Ireton.

Brad'street, Anne (1612–1672), an American poet. She was a daughter of Governor Thomas Dudley and was married to Governor Bradstreet in 1628. Her verses are founded on good English models, but they lack originality, ease and novelty. Modern readers find little of interest in them, but they were exceedingly popular when they first appeared, and Mrs. Bradstreet was given the name of "The Tenth Muse."

Bradstreet, Simon (1603–1697), an early colonial governor of Massachusetts. He was born in Lincolnshire, England, and was educated at Emmanuel College, Cambridge. He emigrated to America in 1630 and was appointed secretary and agent of the colony and commissioner of the United Colonies. In 1653 he opposed the proposed war on the Dutch of New York and the eastern tribes of indians. In 1660 he went to England and acted as agent for the colony. From 1630 until 1679 he served as assistant, and from 1679 until 1686 and again from 1689 to 1692 he was governor of the colony. When Sir William Phipps arrived with a new charter, Bradstreet became first councilor.

Bra'dy, Cyrus Townsend (1861–), an American clergyman and author, born in Alleghany, Pa. After graduating from the United States Naval Academy he resigned from service, worked with two western railroads, and after studying theology, was an Episcopal rector. Later he became archdeacon of Kansas, then of Pennsylvania and finally rector of a Philadelphia church, from which he resigned to devote himself to writing. He was a chaplain in the Spanish-American War and a member of the American Academy of Political and Social Science. He wrote *Recollections of a Missionary in the Great West*, lives of Decatur and Paul Jones, and much popular fiction, such as *Hohenzollern* and *The Southerners*. His stories usually have a distinctly historical background and are of the warlike, masculine type.

Bragg, Braxton (1817–1876), an American soldier, born in North Carolina. He graduated at West Point in 1837, was appointed second lieutenant of the third artillery and served against the Seminoles in Florida. For gallant service in the Mexican War he was brevetted captain, major and lieutenant colonel. In 1856 he resigned from the army and engaged in planting in Louisiana, and at the beginning of the Civil War he was appointed brigadier general in the Confederate army and placed in command at Pensacola, Fla. In 1862 he became major general in command of the second division of the Confederate army, and he held a prominent command at the Battle of Shiloh. After the evacuation of Corinth he succeeded General Beauregard in command of the army in the west He was defeated at Perryville and at Murfreesboro, but was successful at Chickamauga. General Grant defeated him at Chattanooga, and in December of that year Bragg was relieved from command at his own request. He was called to Richmond to act as military adviser to President Davis, with whom he was a favorite. In 1864 he led a small force from North Carolina to Georgia to operate against General Sherman, but he was unsuccessful. After the war he passed his life in retirement, but at one time he was chief engineer for the state of Alabama, and he superintended the improvements in Mobile Bay.

Bragg, Edward Stuyvesant (1827–), an American legislator and soldier, born in New York. He removed to Fond du Lac, Wis., in 1849, practiced law there and in 1854 became district attorney. He was commissioned captain in the Union army in 1861, fought in the Army of the Potomac, at the head of the famous "Iron Brigade," and came out of the war a brigadier general. In 1877 he was sent to Congress, and served four terms as a Democrat. He was appointed minister to Mexico in 1888, consul-general to Havana in 1902 and consul-general to Hongkong in the same year, where he remained until 1906.

Brahe, *brah* or *brah'ay,* Tycho (1546–1601), a Danish astronomer, born at Knutstorp. From early life he manifested an interest in the study of the heavens, and though destined by his uncle for the law he devoted most of his time to astronomical observations. He inherited a considerable fortune, which enabled him to pursue his favorite study in a successful manner. In 1572 he discovered a new star in the constellation Cassiopeia. Later he was offered by Frederick II of Denmark an island on which to establish an observatory, besides the necessary funds for its erection and equipment and ample salary for its care. He accepted the proposition and erected the observatory, where for over twenty years he continued his observations. After the death of Frederick II Brahe was persecuted and finally deposed. He left the country, but continued his astronomical work. At one time the astronomer Keppler was his student, and it is believed by some that much of Keppler's later success was due to what he learned from his celebrated teacher.

Brah'ma, a Sanskrit word signifying (in its neuter form) the Universal Power, or the ground of all existence, not an individual deity, but only an object of contemplation, a universal spirit of which the human soul is a part. It is also (in its masculine form, with long final syllable) a particular god, the first person in the Triad (Brahma, Vishnu and Siva) of the Hindus. The personal god Brahma is represented as a red or golden-colored figure, with four heads and as many arms, often accompanied by the swan or goose. He is the god of the Fates, master of life and death, yet he is himself created, being merely the agent of Brahma, the Universal Power. His moral character is no better than that of the Grecian Zeus.

Brah′manism, a religious and social system prevalent among the Hindus, and so called because developed and expounded by the priestly caste known as the Brahmans. It is founded on the ancient religious writings known as the Vedas, which are regarded as sacred revelations. The Brahmans as a body became custodians and interpreters of these writings, and the priests and general directors of sacrifices and religious rites. As the priestly caste increased in numbers and power, they made the ceremonies more elaborate and added to the Vedas other writings. In time the caste of Brahmans came to be accepted as a divine institution, and an elaborate system of rules was made which defined and enforced its place by the severest penalties, as well as that of the inferior castes, the Kshatriyas, or warriors, the Vaisyas, or cultivators, and the Sudras, or slaves. It was not without a struggle that the warriors recognized the superiority of the Brahmans. It was by the Brahmans that the Sanskrit literature was developed; and they were not only the priests, theologians and philosophers, but also the poets, men of science, lawgivers, administrators and statesmen of the Aryans of India.

The sanctity and inviolability of a Brahman are maintained by severe penalties. Murdering or robbing one of the order are sins for which there is no atonement; even the killing of his cow can only be expiated by a painful penance. A Brahman should pass through four states: first, as Brahmachari, or novice, he begins the study of the sacred Vedas, and is initiated into the privileges and the duties of his caste. He has a right to alms, to exemption from taxes and from capital and even corporal punishment. He is not allowed to eat flesh and eggs and must not touch leather, skins of animals and most animals themselves. When manhood comes he ought to marry, and, as Grihastha, enter the second state, which requires more numerous and minute observances. When he has begotten a son and trained him up for the holy calling, when he sees the son of his son, he ought to enter the third state, and as Vanaprastha, or inhabitant of the forest, retire from the world for solitary praying and meditation, with severe penances to purify the spirit; but this and the fourth or last state of a Sannyasi, requiring a cruel degree of asceticism, are now seldom reached, and the whole scheme is to be regarded as representing rather the Brahmanical ideal of life than the actual facts.

The oldest Vedic literature represents a worship of natural objects; the sky, personified in the god Indra; the dawn, in Ushas; the various attributes of the sun, in Vishnu, Surya and Agni. These gods were asked for assistance in the common affairs of life and were pleased by offerings which, at first few and simple, afterward became more complicated and included animal sacrifices. In the later Vedic hymns a philosophical idea of religion and of the problems of being and creation appears struggling into existence; and this tendency is systematically developed by the supplements and commentaries known as the Brahmans and the Upanishads. In some of the Upanishads the deities of the old Vedic creed are treated as symbolical. Brahma, the supreme soul, is the only reality, the world is regarded as coming from him, and the highest good of the soul is to become united with the divine. The necessity for the purification of the soul for its reunion with the divine nature gave rise to the doctrine of transmigration of souls.

From this philosophical development of Brahmanism came a distinct separation between the educated and the vulgar creeds. While from the fifth to the first century B. C. the higher thinkers among the Brahmans were developing a philosophy which recognized that there was but one god, the popular creed had concentrated its ideas of worship round three great deities—Brahma, Vishnu and Siva, who now took the place of the confused old Vedic Pantheon. Brahma, the creator, though considered the most exalted of the three, was too abstract an idea to become a popular god, and soon sank almost out of notice. Thus the Brahmans became divided between Vishnu, the preserver, and Siva, the destroyer and reproducer, and the worshipers of these two deities now form the two great religious sects of India. Siva, in his philosophical significance, is the deity mostly worshiped by the real Brahman, while in his aspect of the destroyer, or in one of his female manifestations, he is the god of the low castes and is often worshiped with degrading rites. But the highly cultivated Brahman is still a pure theist, and the educated Hindu in general professes to regard the special deity he chooses for worship as merely a form under which the One First Cause may be approached.

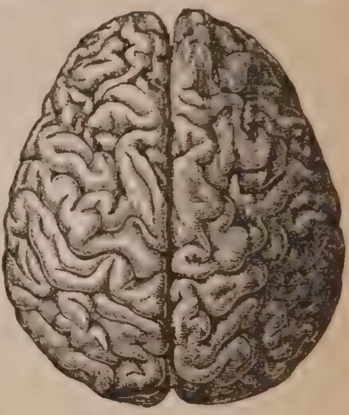
The system of caste originally, no doubt, represented distinctions of race. The early classification of the people was that of "twice-born" Aryans (priests. warriors, husbandmen) and once-born non-Aryans (serfs); but intermarriages, giving rise to a mixed people, and the variety of employments in modern times have greatly modified this simple classification. Innumerable minor distinctions have grown up, so that among the Brahmans alone there are several hundred castes, who cannot intermarry or eat food cooked by one another.

The Brahmans represent the highest culture of India, and as the result of centuries of education and self-restraint have evolved a type of man distinctly superior to the castes around them. They still have great influence and occupy the highest places at the courts of princes. Many, however, are driven by need or other motives into trades and employments inconsistent with the original character of their caste.

Brahmaputra, *brah'ma poot'ra,* a large river of Asia, rising in Tibet flowing southward through the Himalayan Mountains and then westward into India, where it unites with the Ganges about ninety miles above its mouth. The sources of the Brahmaputra are not well known, but they are in mountain regions over 16,000 feet above the sea. In the first part of its course the stream is called the Sanpo, and after it passes through the mountains it is known as the Dihong. It is then joined by the Dibong and Lohit, after which the united streams are known as the Brahmaputra. Its entire length is about 1800 miles, and it is navigable for 800 miles from the sea.

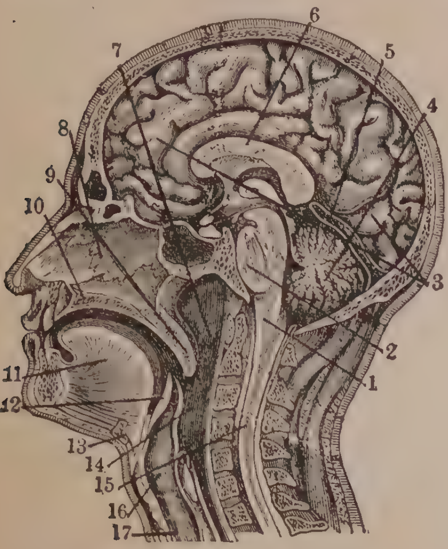
Brahmo-somaj, *brah'ma so mahj',* or the Theistic Church of India, a religious and social association in India. It was founded in 1830 by Rammohun Roy, an enlightened Brahman, who sought to purify his religion from idolatries. This church, while accepting what religious truth the Vedas may contain, rejects the idea of their special infallibility, and founds its faith on principles of reason, accepting what is good in all religions. The members do not in principle recognize the distinction of caste, but consider all men God's children. They have done much toward educating women and abolishing child marriages.

Brahms JOHANNES (1833–1897). a great German composer, born at Hamburg and introduced to the world by Schumann. Though living at various musical centers, he rarely appeared in concert, devoting himself to composition, the result being a rather conventional, though at times brilliant, style of composition. His numerous symphonies, of which the most famous is probably the *Fourth,* and his songs, of which *Wie Bist du meine Konegin* is most commonly heard, are among the most beautiful in all music. His masterpiece was the *German Requiem,* a choral work possessing solemn dignity and remarkable harmony. Though a close student of Wagner's method, Brahms did not follow it, and thus became the idol of the anti-Wagnerian school. However, Brahms himself was a warm admirer of Wagner's genius.



BRAIN, FROM ABOVE

Brain, the center of the nervous system and the seat of consciousness and volition in man and the higher animals, comprising that portion of the nervous system contained within the cranial cavity, with the exception of such portions of the twelve cranial nerves as lie between the brain and the place where they leave the cranium. The human brain is larger and heavier, not only in proportion to the weight of the body, but in actual mass, than that of any other animal except the elephant and some of the whales. The average male European brain weighs about 50 ounces, that of the female about 45 ounces. Since the height and weight of the average woman is about eight per cent less than that of the average man, it appears to be a fact that the average female is possessed of a smaller brain capacity than the average man. In the infant at birth the brain weighs about 10 ounces, and it continues to increase in size until about the eighth year. The weight, however, increases until middle life. The largest brain is said to have been that of Cuvier, about 64 ounces. The smallest brain of an intelligent individual weighs about 35 ounces. Among idiots, however, brains have been found with a weight as low as 8½ ounces, and, on the other hand, the brain of an idiot has been observed to weight as much as 60 ounces. Among the lower races of mankind, the average weight is distinctly lower, ranging in males from 45 to 42 ounces. The brain is composed of the *cerebrum*, *cerebellum*, *pons varolii* and *medulla oblongata*. These and other important parts are shown in the cut. The brain is covered with a delicate membrane, the *pia mater*, which carries the blood vessels that supply the brain with blood. Lining the skull is a tough membrane, the *dura mater*, which extends downward into the fissure that separates the hemispheres of the cerebrum and forms a partition between the cerebrum and cerebellum. The *arachnoid membrane* lies between the other two; it receives its name from its delicate structure, likened to a cobweb. The substance of the brain is gray and white tissue. The gray tissue forms an outside layer of the cerebrum and cerebellum, which in this respect differ from the medulla oblongata and the *spinal cord*, and it forms a covering for the white substance into which it dips in the convolutions that increase its surface. It varies in thickness from one-twelfth to one-eighth of an inch. See Cerebellum; Cerebrum; Medulla Oblongata; Nervous System; Spinal Cord; Anatomy.



SECTION THROUGH HEAD AND NECK

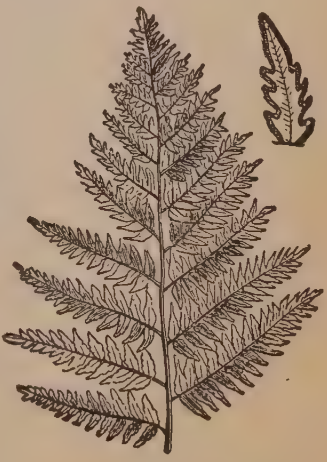
1, medulla oblongata; 2, pons; 3, right lobe of cerebrum; 4, cerebellum in section; 5, blood vessel; 6, corpus striatum; 7, nasal passage; 8, nasal bone; 9, soft palate; 10, hard palate; 11, tongue; 12, epiglottis; 13, os hyoides; 14, esophagus; 15, spinal cord; 16, larynx; 17, windpipe.

Brain'erd, Minn., the county-seat of Crow Wing co., 115 mi. w. of Duluth, on the Mississippi River and on the Northern Pacific and the Minnesota & International railroads. It is in a fertile agricultural region and has a large trade in farm produce, lumber and furs. The river furnishes water power for various manufactures, and the Northern Pacific has large railroad shops here and a hospital for its employes. The city also has a lumbermen's hospital, a number of fine public buildings, a park and athletic grounds. Brainerd was chartered as a city in 1883. Population in 1910, ——8526.

Brain'tree, Mass., a town in Norfolk co., 10 mi. s. of Boston, on the New York, New Haven & Hartford Railway. It is near granite quarries and contains foundries and manufactures of boots, shoes, leather, paper, electrical appliances and various other articles. Braintree has the Thayer Academy and the Thayer Public Library. It was settled in 1634 and was made a town six years later. Population in 1910, including the villages of South and East Braintree, 8066.

Brake, a device for stopping or retarding the motion of a wagon, car or machine, by pressing a shoe against the rims of the wheels. The shoe is usually worked by a simple or compound lever, by which the pressure can be so regulated as to produce a slow motion or a sudden stop. Hand brakes on railway cars are set by winding a chain attached to the lever around an axle turned by a wheel in the hands of the brakeman. See Air Brake.

Brake, a species of fern very common in America and Europe generally, and often covering large areas on hillsides and on untilled grounds. It has a black creeping rootstalk, from which fronds grow often to the height of several feet and divide into three branches. As the plants remain erect in winter, they form a good cover for game throughout the year. The rhizome is bitter, but it has been eaten in times of famine.



BRAKE

Bramante, *bra mahn'ta*, Donato (1444–1514), a great Italian architect. Bramante began his career in Milan, where his greatest work was the choir and dome of Santa Maria delle Grazie. At the age of fifty-five he went to Rome, where a study of the great Roman monuments changed his style completely, and he became the leader of the Middle Renaissance period. He was patronized by the popes, and his greatest work was done as the first architect of the Church of Saint Peter. Owing to his death, his plans were never carried out, but they exercised a great influence on the work of later architects.

Bram'ble, the name commonly applied to a bush with trailing prickly stems, which is called in Scotland, brambles, and in England, blackberry. It is rarely cultivated, but as a wild plant it grows in great abundance. The flowers do not appear till late in the summer, and the fruit, which is deep purple or almost black in color, does not ripen till autumn.

Bran. See FLOUR.

Brandenburg, *brahn'den boorg*, a province of Prussia, situated in the center of the kingdom, bounded on the n. by Mecklenburg, on the e. by Pomerania and the provinces of West Prussia and Posen, on the s. by the kingdom of Saxony and Silesia, and on the w. by the provinces of Saxony and Hanover. The area is 15,381 sq. mi. The surface is flat and is well watered by many lakes and rivers, the chief of which are the Oder, the Elbe and the Havel. The principal crops are barley, rye, potatoes, tobacco, hemp, flax and hops. Cattle-raising is an extensive industry and fish-culture is also important. The most important manufactures are wool, silk, linen, paper and leather. The chief towns are Potsdam, Königsberg and Frankfort-on-the-Oder. The province is divided into two districts, Potsdam and Frankfort, Berlin being a separate division, and into 36 circles. Berlin is the capital, and Brandenburg is the center, of the Prussian monarchy. Since 1415, when Frederick of Hohenzollern was invested with the title of elector of Brandenburg, the province has been under the rule of the present imperial dynasty of Germany. Elector Frederick III transformed the dominions into the kingdom of Prussia in 1701 and took the title of King Frederick I of Prussia. Population in 1900, 3,107,951.

Brandes, *brahn'des*, GEORG MORRIS COHEN (1842–), a Danish literary critic, born in Copenhagen. He was the first man to infuse into Danish thought and literature the ideals and tendencies of modern European literature, and his volumes have raised him to the rank of the foremost modern critics. Among the most important of his earlier work was the series of lectures delivered at the University of Copenhagen and afterward published as the *Main Literary Currents of the Nineteenth Century*, a book which made him unpopular in Denmark and caused him to remove to Berlin. Among his later works were *Danish Poets*, *Eminent Authors of the Nineteenth Century*, *Men and Works in European Literature*, *Essays* and *Poems*.

Bran'dy, the liquor obtained by the distillation of wine, or the refuse of the winepress. It is colorless at first, but usually derives a brownish color from the casks in which it is kept, or from coloring matter added to it. The best brandy is made in France, particularly in the Cognac district in the department of Charente. Brandy of excellent quality is also made in California. Much of the so-called brandy sold in Britain and America is made from more or less coarse whisky, flavored and colored to resemble the real article; and France also exports quantities of this sort of brandy. In America various distilled liquors get the name of brandy, as apple brandy, peach brandy, being named from the fruit from which they are made. Brandy is nearly one-half alcohol and is often used in medicine as a stimulant.

Bran'dywine, BATTLE OF THE, an important battle of the Revolutionary War, fought on Brandywine Creek, near Dilworth, N. J., September 11, 1777. The American force of 11,000 was commanded by General Washington, and it opposed a British army of 18,000 under General Howe. The British took the offensive, and by a brilliant flank movement on the part of Cornwallis, forced the Americans to retreat. The losses were about equal, but the victory enabled Howe to enter Philadelphia.

Brant, JOSEPH (Thayendanega) (about 1742–1807), a Mohawk indian chief. At the age of thirteen he accompanied his two elder brothers, who took part in Sir William Johnson's campaign against the French at Lake George. He was sent to the Rev. Eleazar Wheelock's indian school at Lebanon, Conn., became interpreter to a missionary and was frequently employed by Johnson as an agent among various tribes. During the Revolution the Mohawks adhered to the British, and Brant received a commission in the British army, in which he attained the rank of colonel. He participated in the Battle of Oriskany, one of the bloodiest engagements of the war, and led the indians in many raids on the border settlements of New York, but he was not present at the massacre of Wyoming.

After the war he was of use to the United States in making treaties with the indians. He visited England in 1785 and was received with honor, and with the money raised for him he built a church in Canada.

Brant'ford, a city of Ontario, Canada, situated on the Grand River and on the Grand Trunk railroad, 70 mi. e. of London. The city contains several banks, the Ontario institution for the education of the blind and Wickliffe Hall. The leading industries are the manufacture of mill machinery, stoneware and foundry products. The city is also the site of large railroad shops. The river is navigable, and a canal connects the town with Lake Erie. Brantford was named from the Mohawk chief Brant, and a fine monument was erected to his memory in Victoria Square. The town is the headquarters for the Amalgamated Tribes of the Six Nations. Population in 1901, 16,631.

Brass, an alloy of copper and zinc, of a bright yellow color, and hard, ductile and malleable. The best brass consists of two parts by weight of copper to one of zinc; but any degree of variation may be obtained by altering the proportions; thus, by increasing the quantity of zinc we may form *tombac* and *pinchbeck*, and with nearly a seventh more of zinc than copper the compound becomes brittle and of a silver-white color. By increasing the copper, on the other hand, the compound increases in strength and tenacity. Brass which is to be turned or filed is made workable by mixing about 2 per cent of lead in the alloy, which has the effect of hardening the brass and preventing the tool from being clogged. For engraving purposes a little tin is usually mixed with the brass. Brass is used for a great variety of purposes, both useful and ornamental.

The working of brass requires considerable skill. First, the brass is roughly cast in the foundry. It is brought thence to the finishing bench, where an alloy of copper and tin is cast in molding-sand. The brass molders work at troughs, in which is kept the molding-sand, which is so cohesive that it may be formed as desired. The flask in which the sand is packed around the pattern is made of two frames, one fitting over the other. One frame has little legs of wood, called *dowels*, and the other has holes into which these dowels fit, so that when these frames are brought together one will remain over the other. The frames are made of four pieces of wood fitted up with hinge-like corner-pieces, so that the frame can be unlocked and taken away from the sand without disturbing it. The molder fills one of the frames with sand. In the center and on top of the sand he lays the pattern and presses it into the sand and then fits the other frame over it. He shakes some fine sand over the pattern and fills the upper frame with molding-sand, which he rams down hard. He then scrapes the surplus sand from the top frame with a stick and runs a pointed wire into the sand toward the pattern, thus providing escapes for the gases which form when the molten metal is poured in. He then turns over both frames and carefully lifts the bottom frame, exposing the pattern imbedded in the same. The pattern is withdrawn by driving a steel pin into the wood or by means of a screw pin made for the purpose. If the casting is to be hollow, the cores are now put in place. A core is made of sand and paste rammed into molds and afterward baked in a large oven. When the cores are laid in place in the hollow space left by the pattern, the channels are scooped out, the frames placed together and the woodwork taken off; then the short board, with a block of sand on it, is laid on the floor.

False core work is required for some purposes. A false core is a part of the mold built up separate from the mold proper, and, as it is in small pieces, it can be taken out without removing the pattern. Thus a bust can be buried in the sand, but its rounded, irregular form, its deep-cut and incurving impressions, make it impossible to withdraw it from the sand without bringing part of the mold with it. This is avoided by making a mold out of sand packed so tight and hammered so close into the different parts of the pattern that each part can be taken away, and when the pattern is removed can be properly put together again to form the mold. The brass is melted in crucibles, which are lifted out of the furnace, carried to the molds and emptied into the gate, thus filling the hollow in the sand.

The castings which are to be polished are cleaned in water and acids and then buffed or burnished. Sometimes they are finished by being dipped into solutions of nitric acid and water. If a dead finish is desired the acid solution is much weaker than if a bright finish is wanted. When brass is burnished, it is brought to a high finish by being rubbed with polished steel tools, or it is held against buffing wheels which are made of cotton. A red polish mixture is put on the wheel, and the high speed polishes the brass. This wheel, however, can be used only on smooth and regular surfaces. The brilliancy and polish of brass may be preserved by lacquer, which is put on and dried in an oven. Brass is spun, stamped, pressed and drawn in the same manner as copper, gold or silver. See BRONZE.

Brass'es, MONUMENTAL, large plates of brass inlaid in polished slabs of stone, much used as tombstones during the thirteenth and fourteenth centuries. The figure of the person commemorated was represented either in a carved outline on the plate or in the form of the plate itself. Occasionally an ornamented cross took the place of the figure. The earliest example of these monumental slabs now existing in England is that on the tomb of Sir John d'Aubernoun (1277), at Stoke Dabernon in Surrey. These brasses are of great value in giving an exact picture of the costume of the time to which they belong.

Bras'sey, THOMAS (1805–1870), an English railway contractor and surveyor. His operations were on an immense scale and extended to most of the European countries, as well as to America, India and Australia, one of his greatest works being the Grand Trunk Railway of Canada, with the great Victoria bridge over the Saint Lawrence at Montreal.

Brattleboro, *brat't'l bur'ro,* VT., a town in Windham co., 60 mi. n. of Springfield, on the Connecticut River, and on the Boston & Maine and the Central Vermont railroads. It has a picturesque location, and it contains the Brooks public library, Glenwood Academy and the state asylum for the insane. The manufactures include organs, carriages, furniture and machinery. Brattleboro was chartered in 1753 and takes its name from William Brattle of Massachusetts, one of the original grantees. Population in 1910, 6517.

Brazil', IND., the county-seat of Clay co., 16 mi. n. e. of Terre Haute, on the Chicago & Eastern Illinois and several other railroads. Coal mining is the chief industry. There are also manufactories of mining machinery, and clay products from the extensive deposits in the neighborhood. The city was settled in 1856, and was incorporated in 1873. It has a public library, and it owns and operates its waterworks. Population in 1910, 9340.

Brazil, THE UNITED STATES OF, a republic of South America, extending from 5° north latitude to 34° south latitude, and from 35° to 74° west longitude. Its greatest length from north to south is 2600 miles, from east to west, 2700 miles, and its area is 3,218,000 square miles, or a little less than that of the United States, exclusive of Alaska and island possessions. It is larger than Australia with Tasmania, and includes more than one-half of the area of South America. It is bounded on the n. e. and s. e. by the Atlantic Ocean, and on the n. w. and s w. by all the countries of South America except Argentina and Chile.

SURFACE AND DRAINAGE. The surface consists of three distinct regions: the Brazilian Plateau, with ranges of mountains on the east; the Amazon Basin, which includes nearly all of the interior and extends to the western boundaries, and the Guiana Plateau, which includes that portion of the country north of the Amazon. A number of parallel ranges of low mountains extend across the eastern portion of the Brazilian Plateau. The first of these is parallel with the southeastern coast. None of them is high, and the extreme altitude does not exceed 7000 feet. South of these mountains are a few short ranges extending in a northwest and southwest direction and separating the basin of the Parana from that of the Paraguay. A low range of land, from 30 to 50 miles wide, extends east and west from these ranges of mountains and separates the basins of the Parana and Paraguay from those of the Amazon and the San Francisco. This is generally known as the "height of land." West of the mountain ranges the plateau extends to the basin of the Madeira, and it is in many places deeply cut by river valleys. The valley of the Paraguay is low and swampy.

Along the lower course of the Amazon the basin is from 50 to 150 miles wide, but it expands as it extends inland, until it includes all of the northwestern part of Brazil. As far as known, this interior is a flat plain, seldom exceeding 300 feet in altitude, and in some places the flood plain exceeds 150 miles in width. During high water the Amazon is connected with the Paraguay through the swamps of the Paraguay Valley. The Guiana Plateau includes the country north of the Amazon and extends from the Rio Negro to the Atlantic. Its northern border is formed by the Akrai Mountains, and from these the land slopes gradually to the Amazon.

The Amazon and its tributaries drain about two-thirds of the country and constitute the largest system of navigable rivers in the world. Nearly all streams belonging to the system are navigable for large steamers throughout the year. Several of those entering the Amazon in its lower course have their navigation obstructed by the fall line at the edge of the plateau, but those farther inland are free from obstructions for long distances. The entire mileage of the system is estimated at 19,000 miles, 13,000 of which are open to navigation. The Parana and Paraguay drain about one-fourth of the country, and the San Francisco and other short streams the remainder. The Rio Negro connects with the Orinoco through the Cassiquiare. See AMAZON; MADEIRA RIVER; TOCANTINS; SAN FRANCISCO.

MINERAL RESOURCES. Formerly Brazil was the leading country in the production of gold and diamonds, but the deposits of gold were found in sand and gravel along the rivers, and these have all been exhausted, and the opening of diamond mines in South Africa caused the Brazilian diamond mines to decline. There are precious stones, such as agate and carnelian, and petrified wood in considerable quantities. Of the useful metals there are ores of lead, copper, silver and iron. Lignite of an inferior quality has been found in a number of places, but as yet none of these deposits of coal or ore has been worked to any extent. The mining regions are located among the mountains in the states forming the southern and southeastern portions of the country.

CLIMATE. With the exception of the two most southerly states, Brazil lies wholly within the tropical regions; yet, owing to the modifying influences of altitude and winds, the temperature seldom exceeds 95° and is remarkably even in most portions of the country throughout the year. Most of the country receives a very heavy rainfall; those portions of the Amazon basin near the coast have an annual rainfall of from 75 to 100 inches, but farther inland the fall increases in certain localities to from 300 to 400 inches. The plateau on the east also receives an abundance of moisture, but the states immediately south of the Amazon near its mouth receive less rainfall than other portions of the country and occasionally suffer from prolonged droughts, as do certain portions of the interior. Most of the rain falls between January and June, while from June to October the weather is comparatively clear and dry.

AGRICULTURE. In the southeastern portion and along the Amazon there are extensive areas of fertile land, but the land on the plateau in the interior has not been found suitable for agricultural purposes, though it forms good grazing land. Only a small portion of the fertile land is under cultivation, and the methods of tillage are very primitive. Coffee is by far the largest and most profitable crop, and in the raising of this Brazil leads the world. The crop next in importance is sugar, followed in their order by tobacco and cotton, while in all of the agricultural districts corn, rice, vegetables and tonka beans are grown for home purposes. Sweet potatoes, yams, farina and maize are also raised in some portions of the country.

The forest regions include the great forests of the Amazon, which in many sections are choked with a growth of tropical vegetation that is impenetrable. These are the largest forests in the world, and they supply the inhabitants with many valuable products. It is from the Amazon valley that a large quantity of rubber is gathered each year, while from the forests in the southeast drugs, lumber, dyewood and nuts are obtained.

MANUFACTURES. The manufactures are small, but are gradually increasing in number and importance. They include those industries required for manufacturing raw material and for the reduction of ores. Among these the manufacture of cotton and woolen goods is the most important. In the states of Bahia and Pernambuco there are a large number of sugar refineries, and the manufacture of tobacco products is assuming considerable importance. Machine shops, foundries and tanneries are found in some of the larger cities, but many lines of manufacturing are hindered for lack of suitable fuel.

TRANSPORTATION. Most of the large towns in the southern and eastern states are connected by railway, and numerous short lines extend from the coast inland to the fertile agricultural regions. In all, the country has between 12,000 and 15,000 miles of railway, over half of which is under direct control of the government, and nearly one-third of the remainder is operated under a guarantee of government interest. Roads are few and poor, and in the interior there are practically no roads. The means of communication are either by water or by trails. Because of her extended system of navigable rivers, Brazil has encouraged shipbuilding, and the country now has an excellent merchant marine, which is adequate to all demands for domestic commerce. There are also a few lines of Brazilian steamers devoted to foreign trade. Mail facilities are fair, and the country has over 10,000 miles of telegraph lines.

The commerce is quite extensive, amounting to over $300,000,000 a year. The most important article of commerce is coffee, which constitutes nearly 60 per cent of the total. About two-thirds of it goes to the United States. The other leading exports are sugar, rubber, cotton, hides, tobacco and cocoa. Exports of lesser importance consist of dyes, cabinet woods, gold, diamonds and other precious stones. The imports consist of manufactured goods of all kinds, foodstuffs, including wheat, flour, corn, dressed meat, butter, lard, olive oil and wines. Great Britain, Germany, France and the United States are the leading countries engaged in foreign trade.

Inhabitants and Language. The white inhabitants constitute less than half of the population and are largely of Portuguese descent, though mingled with them are immigrants from Germany, Italy and Spain, with a slight sprinkling of those from Great Britain and the United States. About one-third of the inhabitants are half-breeds, one-seventh negroes and one-tenth indians, some of whom are still living in the savage state. Portuguese is the prevailing language, though some of the native tribes still retain the indian tongue.

Education. While every parish is supposed to provide a primary school for boys and another for girls, but little attention is paid to the law, and nearly 80 per cent of the inhabitants are illiterate. In the more densely populated states of the south and along the eastern coasts school privileges are better. In these states and in the large cities, there are both elementary schools and schools corresponding to the high schools and academies in the United States. There are also schools of medicine, law and science, and the government sustains four military schools and a naval academy.

Government and Religion. The government is a federal republic comprising twenty states and one federal district. It is based on a constitution which very closely resembles that of the United States. The executive power is vested in a president and vice-president, and six ministers, who are at the head, respectively, of the departments of finance; war; industry, railways and public works; foreign affairs; navy; and interior and justice. The legislative department consists of a Senate and House of Representatives. The Senate consists of three members from each state, elected by the people for nine years, the terms of one-third of the senators expiring every three years. The House of Representatives consists of deputies elected by popular vote for four years, and apportioned to the states according to population. The judicial power is vested in a national Supreme Court, consisting of fifteen judges appointed by the president and confirmed by the Senate. Each state has its own governor and legislature and is in many respects more independent than are the states of the American Union, since the states of Brazil have the privilege of treating with foreign powers concerning commercial affairs, and any state may divide its territory into other states or two or more states may consolidate. Each state is divided into municipalities and districts for the purpose of local government.

The Church and State are entirely separated. While all faiths are tolerated, over 90 per cent of the inhabitants are Roman Catholics, and the government provides for the maintenance of the Roman Catholic Church.

Cities. The most important cities are Rio de Janeiro, the capital, Bahia, Sao Paulo, Pernambuco, Belem and Porto Alegre, each of which is described under its title.

History. Brazil was first seen by Vicente Pinzon in 1500. Between 1532 and 1535 the country extending from 30° south to the equator was divided into twelve districts whose boundaries extended westward without limit. These districts were granted to independent captains for colonization, but the plan failed and the claims reverted to the Portuguese crown. The early settlers enslaved the natives, and in 1549, when Jesuit missionaries began to work among the indians, the settlers entered a protest against this practice. After a prolonged conflict, in 1680 slavery of the indians was abolished, but negro slavery took its place.

From 1580 to 1640 the country was in the possession of Spain. In 1691 gold was discovered, and diamonds were found about twenty years later. These discoveries led to a rapid increase in the number of settlers. At the invasion of Portugal in 1807 by the French, Brazil became the residence of the royal family and was for fourteen years the seat of government. When King John VI returned, he left his oldest son, Dom Pedro, as prince regent of Brazil but in 1822 the country proclaimed her independence and made the regent emperor. Dom Pedro was succeeded by his son, Dom Pedro II, who was invested with the crown at fifteen years of age. He proved a wise and able ruler, and during his long administration the country made rapid advancement; but notwithstanding Dom Pedro's excellent rule, there was a growing desire for a republican form of government, and in 1889 the royal family retired to Portugal, and the present government was organized. The population is about 17,500,000. Consult Burton's *Explorations of the Highlands of Brazil.*

Brazil'wood, a kind of wood yielding a red dye, obtained from several trees native of the West Indies and Central and South America. The wood is hard and heavy, and as it takes on a fine polish it is used by cabinet-makers for various purposes. The dye is obtained by reducing the wood to powder and boiling it in water.

Brazos, *brah'zose,* a river of Texas, formed by the junction of Clear and Salt forks. It flows southeast by a winding course and empties into the Gulf of Mexico, 40 mi. s. w. of Galveston. It is the largest river of the state, has a length of 900 miles and is navigable during high water for 300 miles, and at all seasons for 40 miles from the Gulf.

Brazza, *braht'sa,* an island situated in the northern part of the Adriatic Sea and forming a part of the province of Dalmatia of Austria-Hungary. Its area is 150 square miles. The surface is somewhat mountainous, but the soil is fertile and on the slopes of the mountains produces olives, figs, grapes and other semi-tropical fruits, while grain is grown on the lower lands. A celebrated marble quarry is also located here. Population in 1900, 24,465.

Bread, *bred,* the flour or meal of grain, kneaded with water into a tough and consistent paste, and baked. There are numerous kinds of bread, according to materials and methods of preparation; but all may be divided into two classes: *fermented, leavened* or *raised,* and *unfermented, unleavened, not raised.* The latter is the simpler, and no doubt was the original, kind, and is still exemplified by biscuits, the oat cakes of Scotland, the corn bread of America, the *dampers* of the Australian colonies and the still ruder bread of savage races. It was probably by accident that the method of bringing the paste into a state of fermentation was discovered, by which its toughness is almost entirely destroyed, and it becomes porous, palatable and digestible. All the cereals are used in making bread, each zone using those which are native to it. Thus maize, millet and rice are used for the purpose in the hotter countries; rye, barley and oats in the colder, and wheat in the intermediate or more temperate regions.

In the most advanced countries bread is made from wheat, which makes the lightest and most spongy bread. The fermentation necessary for ordinary loaf-bread is generally produced by means of leaven, or yeast. Most bakers use the compressed yeast, which is dissolved in warm water and poured into the "mixer." Enough flour is added to make a thin paste. This is left two or three hours to ferment, and then the sponge is ready to be made into dough. Salt is put in the sponge, then milk, lard and sugar, and finally enough flour to make a good stiff dough. The mixer is a semi-cylindrical trough, about four feet long, in which is a shaft with iron arms running spirally around it, and this becomes a kneading machine when the dough is made up and the sponger shifts the belt to the tight pulley. The iron arms revolve in the trough, working the dough over and over. The dough is sliced from the arms of the machine as it drags through the mass, thus allowing it to work every particle of dough. From this trough the dough is put into deep wooden troughs, where it is kept covered for two or three hours. During this time it is carefully watched, and now and then it is "beaten down" by two men, who pass their arms into the dough. The dough is then taken from the trough and thrown on to a bench. One of the benchmen cuts off a batch of dough weighing about fifteen pounds and places it in a dividing machine, which forces a number of cutting edges up through the dough, dividing it into twelve equal parts. These are torn apart and tossed on to a bench, where they are quickly kneaded and molded into round loaves, which are placed in wooden boxes, where they remain for some time. Then the dough is taken out and worked again, after which it is nicely molded into loaves and placed in pans 9 inches long, 4½ inches high and 4½ inches wide. In a short time these are placed in the oven. An ordinary baker's oven is about sixteen feet in diameter, and is circular in shape. The bottom of the oven is made of soapstone and revolves over the fire. The pans containing the dough are placed in the oven by means of a large wooden paddle. The oven will hold about three hundred fifty loaves, and will bake them in about a half hour. As soon as the loaves are brought from the oven they are removed from the pans and taken to a cool, dry room, whence they go to the wagons for delivery.

Vienna bread is made by a process which differs from the above in some respects. Instead of being put into boxes the dough is rolled into long, slim pieces, and each piece is wrapped in canvas bagging and laid away until ready for the oven. Then the canvas is removed and the loaves are laid directly on the bottom of the oven, and not in pans. Before it is placed in the oven each loaf is washed with a cornstarch preparation, and three slices are made along the top of the loaf with a keen knife. When the loaves are laid on the soapstone, the oven is charged with steam, and this, with the cornstarch preparation, gives Vienna bread its peculiar crisp crust. About two hundred fifty loaves of bread are made from a barrel of flour, and the average loaf is supposed to weigh a pound.

Aërated bread, so called, because made with aërated water, that is, water strongly impregnated with carbonic acid under pressure, is unleavened bread, the dough being also worked up under pressure and caused to expand by the carbonic acid when the pressure is removed. *Brown* or *whole-flour* bread is considered to be very wholesome. It is made from undressed wheat and consequently contains the bran as well as the flour.

BREADFRUIT

Bread'fruit, a large round fruit of a pale-green color, six or eight inches in diameter, marked on the surface with irregular six-sided depressions, and containing a white and somewhat stringy pulp, which when ripe becomes juicy and yellow. The tree that produces it grows on the islands of the Indian and South Pacific oceans. It is about forty feet high, with large and spreading branches and large, bright green leaves over a foot in length. The fruit is generally eaten immediately after being gathered, but it is also often prepared so as to keep for some time, either by baking it whole in close, underground pits, or by heating it into paste and storing it underground, where a slight fermentation takes place. The eatable part lies between the skin and the core and is somewhat of the consistency of new bread. Mixed with cocoanut milk it makes an excellent pudding. The inner bark of the tree is made into a kind of cloth. The wood, when seasoned, closely resembles mahogany and is used for the building of boats and for furniture. The jack much used in India and Ceylon is another member of this genus.

Bread'-nuts, the seeds of a tree of the same order as the breadfruit (See BREADFRUIT). The bread-nut tree is a native of Jamaica. Its wood, which resembles mahogany, is useful to cabinetmakers, and its nuts make a pleasant food, in taste not unlike hazelnuts.

Break'water, a work constructed in front of a harbor to serve as a protection against the violence of the waves. The name may also be given to any structure which is erected in the sea, with the object of breaking the force of the waves without and producing a calm within. Breakwaters are usually constructed by sinking loads of unwrought stone along the line where they are to be laid, and allowing them to settle under the action of the waves. When the mass rises to the surface, or near it, it is surmounted with a pile of masonry, sloped outwards in such a manner as will best enable it to resist the action of the waves. The great breakwaters are those of Cherbourg in France, Plymouth in England, Delaware Bay and Buffalo in America. In less important localities floating breakwaters are occasionally used. These are built of strong open woodwork, partly above and partly under water, divided into several sections and secured by chains attached to fixed bodies. The breakers lose nearly all their force in passing through the beams of such a structure.

Breccia, *brech'chah*, a variety of conglomerate rock, composed of fragments of the same or different rocks, united by another mineral which serves as a cement. The cement is usually some compound of lime or silica. Some of the varieties of marble are a calcareous breccia, in which fragments of the same rock have been so cemented together as to form a beautifully mottled surface when polished. Breccia having peculiar markings is found in Spain and some other countries of the Mediterranean. When the cement is strong, so as to form a hard rock, breccia is highly prized for finishing interiors. Occasionally formations contain fossils, and all are interesting on account of their peculiar appearance. Pudding stone is a variety of breccia in which rounded stones or pebbles take the place of angular fragments.

Bréche de Roland, *bresh de ro lahN′*, that is, *the breach of Roland*, a mountain pass in the Pyrenees, between France and Spain, a few miles west of Mont Perdu, which, according to a well-known legend, was opened up by Roland, one of the paladins of Charlemagne, with one blow of his sword Durandal, in order to afford a passage to his army. It is an immense gap in the rocky, mountain barrier.

Breck′enridge, John Cabell (1821–1875), an American soldier and statesman. He was educated at Center College, Ky., and began the practice of law. He served in the Mexican War as major of a volunteer regiment. On his return he was elected to the Kentucky legislature and to Congress in 1851 and 1853 as a Democrat. In 1856 he became vice-president of the United States, with Buchanan as president, and in 1860 was nominated for president by the extreme Southern Democrats, who withdrew from the national convention that was held in Charleston, S. C. He received the electoral vote of all the slave states, except Virginia, Kentucky, Tennessee and Missouri. In 1861 he took his seat in the United States Senate as successor to John J. Crittenden of Kentucky, but resigned December 4, to enter the Confederate army, in which he was first appointed brigadier general, then major general. He commanded the Confederate reserve at Shiloh and the right wing of General Braxton Bragg's reserve at Murfreesboro. He served at Chickamauga and Chattanooga, at Cold Harbor, in Early's advance on Washington, and shared in his defeat by Sheridan near Winchester, Va., September, 1864. From January till April, 1865, he was secretary of war in Jefferson Davis's cabinet, and after the downfall of the Confederacy he went to Europe. He returned to Kentucky in 1868 and practiced law until his death.

JOHN C. BRECKENRIDGE

Breckinridge, William Campbell Preston (1837–1904), an American congressman and orator, born at Baltimore, Md. He graduated from Center College, Ky., in 1855, and two years later graduated in law from the University of Louisville. He served as colonel of a Kentucky cavalry regiment in the Confederate army. He was a member of Congress from 1884 to 1895, as a "gold democrat."

Breda, *bra dah′*, a town in Holland, province of North Brabant. Breda was once a strong fortress and of great military importance as a strategical position. From the sixteenth to the end of the eighteenth century it had an interesting military history of sieges, assaults and captures. It is celebrated for the association of nobles formed in 1566 under the name of "Compromise of Breda," and for the peace signed there in 1667 between England and Holland. Population, 26,900.

Breech. The breech is the solid mass of metal behind the bore of a gun, that by which the shock of the explosion is principally sustained. In breech-loading arms the charge is introduced here, there being a mechanism by which the breech can be opened and closed. In small arms the advantages of breech-loading for rapidity of fire and facility of cleaning have recently recommended it to general use, and its efficacy for military purposes was effectively demonstrated by the Prussian campaign against Denmark and Austria in 1864 and 1866. Since that time every government has adopted the new system, both in small arms and heavy ordnance, while beerch-loading sporting arms are also in general use.

Breed′ing, the art of improving races or breeds of domestic animals and plants, or modifying them in certain directions, by continuous attention to their pairing in the case of the former and to cross-fertilization in the latter. Animals show great susceptibility of modification under systematic cultivation; and there can be no doubt that by such cultivation the sum of desirable qualities in particular races has been greatly increased. Individual specimens are produced possessing more good qualities than can be found in any one specimen of the original stock; and from the same stock many varieties are taken characterized by different perfections, the germs of all of which may have been in the original stock but could not have been developed at the same time in a single specimen.

When an effort is made to develop rapidly, or to its extreme limit, any particular quality, it is always made at the expense of some other quality, or of other qualities generally, by which the intrinsic value of the result is necessarily affected. High speed in horses, for example, is only attained at the expense of a sacrifice of strength and power of endurance. So the celebrated merino sheep are the result of a system of breeding which reduces the general size and vigor of the animal and diminishes the value of the carcass. Much care and judgment, therefore, are needed in breeding, not only in order to produce a particular effect, but also to produce it with the least sacrifice of other qualities.

Breeding, as a means of improving domestic animals, has been practiced more or less systematically wherever any attention has been paid to the care of live stock, and nowhere have more satisfactory results been obtained than in Great Britain. The United States, France and Germany have also attained a high distinction by their development of high-bred live stock.

Bre'men, a free city of Germany, an independent member of the Empire, one of the three Hanse towns, on the Weser, about 50 mi. from its mouth. Here are the cathedral, founded about 1050, the old Gothic council house, the townhall, the merchants' house and the old and the new exchange. The city abounds in many interesting old and modern public monuments and statues. The manufacturing establishments consist of tobacco and cigar factories, sugar refineries, rice mills, iron foundries, machine works, rope and sail works and ship-building yards. Its situation renders Bremen the emporium for Hanover, Brunswick, Hesse and other countries traversed by the Weser, and next to Hamburg it is the principal seat of the export and import and emigration trade of Germany.

Bremen was made a bishopric by Charlemagne about 788, was afterward made an archbishopric and by the end of the fourteenth century had become virtually a free, imperial city. Bremen was a free port until 1888, when it was incorporated in the Imperial Zollverein. The constitution is in most respects republican. Population in 1900, 163,292.

Bremer, *bra'mur,* FREDRIKA (1801–1865), a Swedish novelist. She wrote an account of her travels in the United States, in Italy, Greece and Palestine; but her fame rests chiefly on her novels, among the best of which are *Neighbors, The President's Daughters, Nina* and *Strife and Peace.* These have been translated into English by Mary Howitt.

Brenham, *bren'am,* TEX., the county-seat of Washington co., 75 mi. n. w. of Houston, on the Gulf, Colorado & Santa Fé and the Houston & Texas Central railroads. The city is in an agricultural and cotton-growing region, and it has cotton and cotton-seed oil mills, and foundries, machine shops and wood-working factories. There are two parks of note, besides a fair grounds. The Blim Memorial and Evangelical Lutheran colleges are located here. Brenham was settled in 1844 and was first incorporated in 1866. Population in 1900, 5968.

Brent Goose, a wild goose, inhabiting most of the northern hemisphere, remarkable for its length of wing and the extent of its migratory power. It appears along the Mississippi in the autumn, but at the approach of spring it migrates farther north, where it breeds.

Brescia, *bresh'shah,* a city of northern Italy, capital of a province of the same name, 52 mi. e. of Milan. Among its chief buildings are the new cathedral, the Rotonda, or old cathedral, the city hall, called La Loggia, and the Broletto, or courts. Besides these, there are a museum of antiquities, a botanic garden, a fine public library and a theater. Near the town are large iron works, and the firearms made here are esteemed the best that are made in Italy. There are also silk, linen and paper factories, tanyards and oil mills. Brescia was the seat of a school of painting of great merit. The city was originally the town of the Cenomanni, and it became the seat of a Roman colony under Augustus about 15 B. C. In the Middle Ages it rose to be an important city republic, and in the beginning of the fifteenth century it was under the protection of Venice. In 1815 it was assigned to Austria by the Vienna Treaty, and in 1859, to Sardinia by the Treaty of Zurich. Population in 1901, 45,454.

Breslau, *bres'low,* a city in the German Empire, excelled in population only by Berlin, is the capital of the province of Silesia, and is situated on the Oder. The public squares and buildings are handsome, and the fortifications have been converted into fine promenades. The cathedral, built in the twelfth century, the Stadthaus, the Church of Saint Elizabeth, and the Rathhaus, or town hall, a Gothic structure of about the fourteenth century, are among the most remarkable buildings. There is a flourishing university, with a museum, a library of 400,000 volumes, an observatory and other buildings. Breslau has manufactures of machinery, railway carriages, furniture and cabinet ware, cigars, spirits and liquors, wool, linens, musical instruments, porcelain and glass, and carries on an extensive trade. It was the seat of a bishopric by the year 1000, and in the Middle Ages it was ruled successively by the kings of Poland, the dukes of Breslau and the kings of Bohemia. In 1741 it was conquered by Frederick II of Prussia. Population in 1900, 422,738.

Brest, a seaport in northwestern France, 389 mi. w. of Paris by rail. It has one of the best harbors in France and is the chief station of the French marine. The entrance is narrow and rocky, and the coast on both sides is well fortified. Brest stands on the summit and sides of a projecting ridge, many of the streets being exceedingly steep. Several of the docks have been cut into the solid rock, and a breakwater extends far into the roadstead. The manufactures of Brest are inconsiderable, but it has an extensive trade in cereals, wine, brandy, sardines, mackerel and colonial goods. Population in 1901, 68,750.

Breton, *bre toN',* JULES ADOLPH (1827–1906), a French painter, born at Corrières. His genius lay in depicting the life of the peasants among whom he was born. His works are characterized by tender feeling, but they lack that strength and power which mark Millet's work. Among Breton's principal paintings are *Blessing the Grain; Return of the Gleaners,* his most celebrated work; *Planting a Calvary,* and *Song of the Lark,* also very popular. Breton also wrote both poetry and prose. Among his literary works are *Jeanne, The Life of an Artist, A Peasant Painter* and *The Fields and the Sea.*

Bre'viary, a book containing all the ordinary and daily services of the Roman Catholic Church, except those connected with the celebration of the Eucharist, contained in the *Missal,* and those for special occasions, as funerals, baptisms, marriages, contained in the *Ritual* or *Pontifical.*

Brew'er, DAVID JOSIAH (1837–1910), an American jurist, born at Smyrna, Asia Minor, the son of an American missionary. He graduated at Yale in 1856, studied law with his uncle, David Dudley Field, graduated at Albany Law School in 1858 and practiced in Leavenworth, Kan., where he served successively as probate judge, district judge and justice of the state supreme court. He resigned the last position in 1884, after fourteen years' service, to become United States circuit judge. President Harrison appointed him associate justice of the United States Supreme Court in 1889, and he was a member of the Venezuelan Boundary Commission and arbitration tribunal.

Brewing, in its broadest sense, the process of manufacturing liquors not made by distillation. In the United States the term is restricted to the manufacture of malt liquors. The first process in brewing is *malting.* This consists in causing the grain to germinate for the purpose of changing the starch into sugar. The grain is cleaned and then placed in large tanks of cold water, where it remains for three or four days. This step in the process is known as *steeping.* From the steeping tanks the grain is taken to the malt house, where it is spread upon the floors to the depth of ten or twelve inches and is allowed to remain until the sprouts appear. The grain is then removed to the dry kiln, where it is heated to 100° F. for pale malt and 150° for brown malt. The heating arrests germination and leaves the malt dry and crisp.

The malt is then crushed or roughly ground in a mill and thoroughly mixed with hot water, forming what is known as the *mash.* This is placed in a tank, where it is heated to 170°. The tanks are provided with mechanical mixers which constantly stir the liquid. After remaining in the mash tanks for two or three hours, the liquid is drawn off and is known as the *wort.* This is placed in copper boilers and boiled with hops, after which it is drawn off and cooled and run into vats containing yeast. In these vats fermentation takes place. After the fermentation has proceeded to the proper stage, the liquor is run into barrels or larger casks and placed in cool cellars.

In the United States barley is the grain most extensively used in the manufacture of malt liquors, but wheat, oats or other grains may be used. The kind of liquor depends largely upon the treatment of the malt, the quantity of hops used and the stage in which fermentation is arrested. See ALE; BEER; CHICA.

Brew'ster, SIR DAVID (1781–1868), a Scotch physicist, one of the greatest scientists of the nineteenth century. He was educated for the ministry, but gave this work up to study science, to which he was first attracted by the lectures of Robson and Playfair. In 1808 he became editor of the *Edinburgh Encyclopedia* and the next year, in conjunction with Jameson, founded the *Edinburgh Philosophical Journal,* which later became the *Edinburgh Journal of Science.* Brewster was one of the founders of the British Association for the Advancement of Science and was its president in 1850. In 1838 he was chosen principal of the united colleges of Saint Leonard and Saint Salvador at Saint Andrews, and later he was made principal of the University of Edinburgh. Among his inventions were the polyzonal lens, the kaleidoscope and the improved stereoscope. His chief works are a *Treatise on the Kaleidoscope, Letters on Natural Magic, Martyrs of Science* and *Life of Newton.*

Brewster, WILLIAM (1560–1644), the leader of the *Mayflower* Pilgrims, born at Scrooby and educated at Cambridge. He left the Established Church and founded a separate society in his house. In 1608 he went to Holland and opened a school at Leyden. He was made ruling elder and conducted the Pilgrims in the *Mayflower* to Plymouth, Mass., in 1620. Brewster was their only spiritual teacher for some years, but he did not administer the sacraments. He is venerated as the ruling spirit in the earliest New England colony.

Bri'bery, in law, the offering or giving of reward for the purpose of inducing the receiver to act unlawfully in favor of the giver. It is especially common in connection with public service. A bribe need not be money, but may consist of anything which constitutes a satisfaction, such as property, position or service. Before the law, both parties to the transaction are held equally guilty, and large fines and even imprisonment are the punishments inflicted.

Brice, *brise,* CALVIN STEWART (1845–1898), an American lawyer and politician, born in Ohio. He graduated at Miami University in 1863, served in the Union army during part of the war and practiced law for a time, but soon engaged in business, being connected with numerous railroads, the most important being one projected between Hankow and Canton, China, in the promotion of which he was interested at the time of his death. He was a Democrat in politics, was chairman of the national committee in 1889 and in the following year became a leading member of the United States Senate.

Brick, a sort of artificial stone, made by molding a mixture of clay and sand and drying it in the sun or baking or burning in a kiln. Bricks are of great antiquity, and sun-dried bricks have been found in Egypt, Assyria, Babylonia and many other ancient countries. Many of these bricks contain inscriptions which are of great historic value, since they constitute the only known record of people and events of the time in which they were made. The Romans also made and used bricks, and it was through these people that the art of brick-making was introduced into England.

In the manufacture of brick a good clay should be selected. This should be free from the remains of animals and plants and should contain but little iron or lime. The clay should also contain about one part sand to two parts clay. If this proportion of sand is not present, enough needs to be added to make the required proportion. The clay is usually dug in the fall and spread upon the ground in small heaps, where it lies exposed to the weather and frost during the winter. By this means it is broken into small pieces and can thus be the more easily handled. The clay and sand in proper proportions are ground with water into a plastic mass, which is forced out of the machine through an opening that forms a column having the length and width of a brick. As this column comes from the machine it is cut by wires into bricks of the required thickness. These fall upon an endless belt that carries them either to a machine for re-pressing or to tram cars that take them to the drying sheds or drying tunnels, according to the plan of the plant. The bricks intended for finishing or facing either outside or inside walls are re-pressed in a steel mold to give them a smooth finish and sharp edges and corners. A good machine will make 100,000 bricks in a day.

The bricks are burned by placing them in kilns, which are either temporary or permanent. The old method was to pile the soft bricks in such a way that a pile contained a number of arches for fires and left spaces between the bricks so that the flame and hot air could reach them all. After completion, the pile was plastered over with clay or mortar, and the fire was started. But the present method is to use permanent kilns. These are circular, about thirty feet in diameter and from ten to twelve feet high. The soft bricks are placed in these kilns so that the fire can surround them and raise all to the same temperature. Firing requires from six to ten days. The common brick are heated to a cherry red, and the harder brick to a white heat.

There are numerous varieties of brick. The ordinary brick used in building and paving is eight inches long, four inches wide and two inches thick. Bricks of this style outnumber all other varieties. *Pressed* brick are those repressed in the process of making and used for the finishings of exteriors and interiors. *Fire* brick are made of fire clay and are used for filling the interior walls of fireproof buildings and lining the fire pots of furnaces and coal stoves. *Hollow* tiles are often used in constructing partitions in fireproof buildings. *Pavement* brick contain lime, which fuses when they are burned and makes them very hard. They are sometimes called *vitrified* brick.

Bricks are extensively used in building, since the erection of steel frame buildings in cities makes them specially valuable in the construction of walls. They are also used for foundations, sewers, cisterns and numerous other purposes. Paving brick are used in paving the streets of cities. Brickyards are found wherever brick clay can be obtained and there is a local demand for the brick. In the United States the greatest centers of the brick industry are along the Hudson River from Troy to New York City, in Philadelphia County, Pa., and in Cook County, Ill. The country produces about 25,000,000,000 bricks a year, having a value of over $78,000,000. See BRICKLAYING; CLAY; TILE.

Brick'laying. In many countries the only available material for house building is brick. The solidity and durability of a brick building depends largely upon the manner in which the bricks are laid. In laying the foundations of walls, the first courses should be thicker than the intended superstructure, and the projections thus formed, usually of quarter brick on each side, are called *set-offs*. Mortar composed of lime and sand is the common cement for brickwork. It should be equally and carefully applied. The most important thing in bricklaying is to see that the wall is properly bonded. The bricks of every course should cover the joints of the course below it, or, to use the bricklayer's phrase, the work must *break bond*. A layer of bricks is called a *course*. Bricks laid with their lengths in the direction of the course and their sides to the wall face, are called *stretchers*; those laid transversely, with their ends forming the wall face, *headers*; a layer of headers, a *heading course*; of stretchers, a *stretching course*.

The two kinds of bond almost exclusively used consist of alternate stretching and heading courses; and of a stretcher and header laid alternately in each course. The first bond is the strongest, but the second bond is the more ornamental and is in most general use. In order to strengthen the bond, bands of hoop-iron, tarred and sanded, are sometimes laid flatwise between the courses. This *hoop-iron bond* has superseded the old practice of using bond-timbers. Walls of brick are frequently built hollow, and these dry quicker and perhaps more thoroughly than those built solid. In such walls there is a thin outer and inner face of brick with hollow spaces between. Different ways are adopted for bonding or tying these walls. Hollow bricks are also used for walls, partitions, floor arches and other work. Neat pointing of the joints often gives a very pretty appearance to brick-work.

Bricks of the ordinary rectangular shape are often used for arches, leaving the gaping interstices at the upper ends to be filled with mortar or chips of brick. Such an arch cannot be strong. As the joints radiate to a center, the arch bricks should be cut to the proper form, just as arch stones are cut to the right shape. See BRICK; BUILDING.

Bride'well, originally a well in London dedicated to Saint Bride. In 1522 a palace was built here by Henry VIII for the accommodation of Charles V. Edward VI gave this house over to the city as a workhouse for the poor and a house of correction. In general, the term means any house of correction or punishment.

Bridge, a structure of wood, stone, brick, iron, or other material, affording passage over a stream, valley, or another passageway, such as a railway or a carriage road. The earliest bridges were undoubtedly trunks of trees felled across narrow streams. These were followed by wooden structures built on a more elaborate plan. Bridges having wooden piers were in common use among the Romans, and the *Pons Sublicus*, erected 621 B. C., is the oldest structure of the kind of which we have any record.

ARCH BRIDGES. The Romans were also the first people to make use of the arch in building bridges and other structures. Portions of their great arched sewer, the *Cloaca Maxima*, still remain as a monument to the durability of their work. After the construction of such a work as this, the building of arched bridges across the Tiber must have been comparatively easy. One of the first examples of these structures was the bridge built by Augustus over the Nera, at Narni. It contained four arches, the longest having a span of one hundred forty-two feet. The bridges of the Romans were, however, distinguished more for their durability than for either the length of span in their arches or the lightness of their piers. The arches of Roman bridges seldom had a span exceeding seventy or eighty feet.

Arch bridges consist of one arch or a series of arches. Formerly stone was the only material used in their construction, but now concrete is often employed. See ARCH; CONCRETE.

All large bridges are constructed after one of the following plans, arch, truss, tubular, cantilever, or suspension.

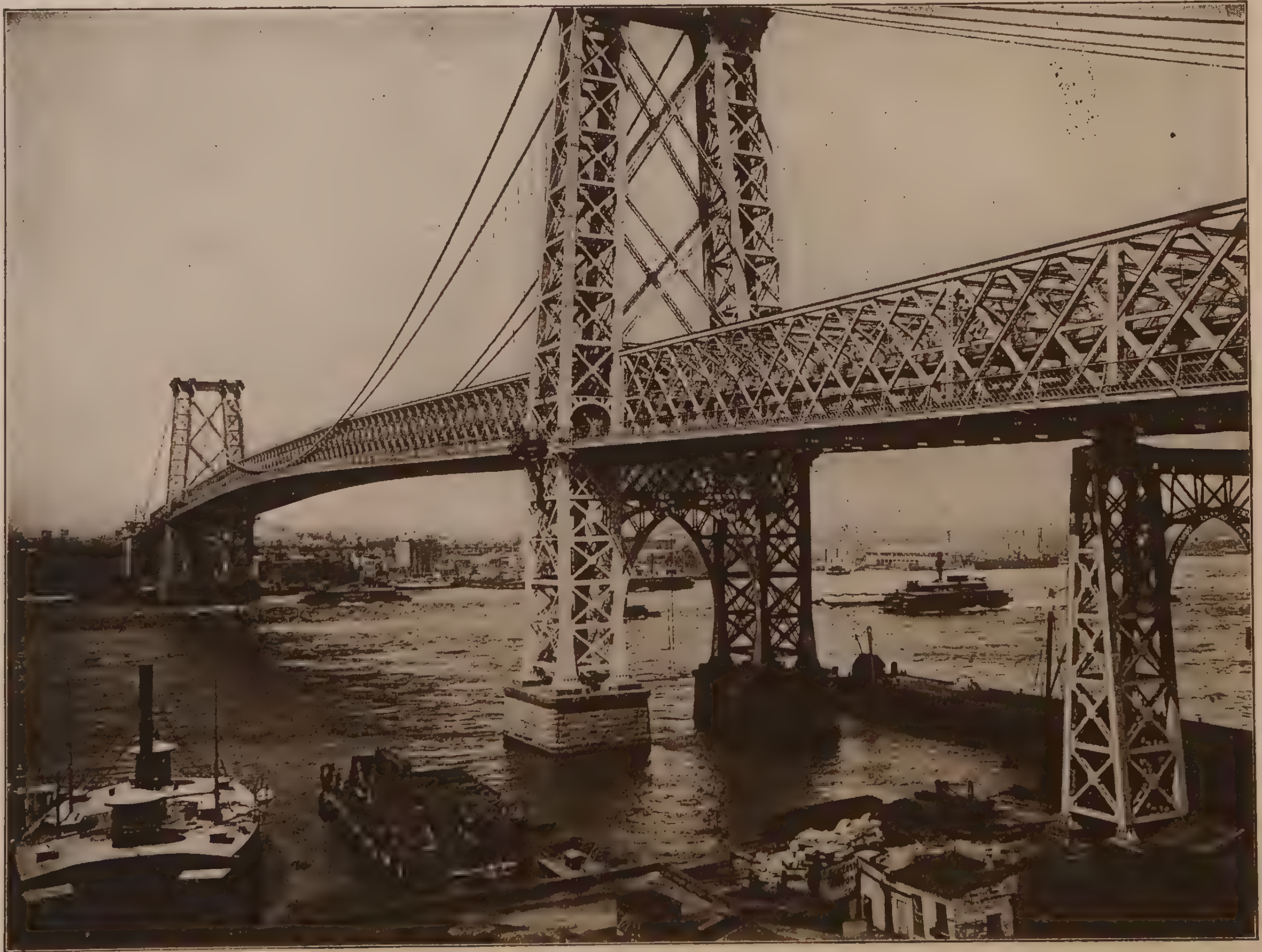
TRUSS BRIDGES. Iron was first employed in the construction of bridges about 1777. The first iron bridges were after the pattern of the stone arch, and cast-iron was used. The nature of the material gave the engineers greater latitude, however, and enabled them to construct arches with longer spans. The arch was gradually superseded by the girder and truss, and cast-iron by wrought-iron and steel, which is now the material almost universally employed in the construction of bridges.

The abundance of timber in the United States led to its very general use for bridges for a long time. The necessity of spanning large streams early led to the invention of a framework which was self-supporting between the piers, and also of sufficient strength to sustain any load that the bridge was required to carry. Such a structure is known as a truss. Trusses are of two kinds, simple, and arched. A simple truss is one supported at its two ends without exerting any lateral pressure; an arched truss exerts both lateral and vertical pressure upon its supports. The first truss bridges were made of wood, and a few remarkable structures of this kind are still to be found in Europe and in the United States.

TUBULAR BRIDGES. A tubular bridge consists of a tube, either rectangular or circular, made by riveting steel plates together. The tube rests on piers and abutments, and the roadway passes through the tube or over the top. The most noted bridge of this pattern is the Britannia Bridge over the Menai Straits, in Wales. This bridge has two spans of 450 feet and two of 250 feet; the tube is made of cast and wrought iron, and is 1380 feet long, 28 feet deep and 13 feet 8 inches wide in the clear. The tube contains a single track. At the time of its completion, the Victoria Bridge across the Saint Lawrence River at Montreal was the most celebrated bridge in the world. Its total length was 1¾ miles; it contained 25 spans, the center one having a length of 330 feet, and each of the others that of 242 feet, and cost about $7,000,000. Both of these bridges were designed by Robert Stephenson of England. The Victoria Bridge was replaced by one of the steel truss pattern in 1898.

From the standpoint of the engineer, the length of span is the most important factor to be considered in the construction of bridges. Usually, the longer the span, the greater the difficulties to be overcome; hence, bridges with long spans rank higher as works of engineering than those of short spans, even though the latter class may include bridges of greater length. Some of the most celebrated truss bridges in the United States are the following: that across the Ohio River at Cincinnati, having a span of 550 feet; the bridge of the Illinois Central Railway across the Ohio at Cairo, Ill., having a span of 518½ feet; and the celebrated Eads Bridge at Saint Louis, having three spans, one of which is 515 feet, and the others 497 feet each. This bridge is of the arched truss type and has two railway tracks, two tracks for electric cars, a driveway and sidewalks. At the time of its construction the middle arch was the longest in the world.

CANTILEVER BRIDGES. Bridges of the cantilever type are taking the place of the old style truss and arch in many places. A cantilever truss has a shore arm and a river arm, which are supported on a tower in such a way that they practically balance each other. The river arms are joined by a central truss, and the entire structure is so made that the strain of the load is very evenly distributed over the bridge. The cantilever truss has great advantage over other patterns from the point of economy in construction, since temporary structures are required only under the shore arms. The river arms are extended from the towers and are self-supporting during construction. When joined by the center truss, the structure is complete. The first important bridge of this type was



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THE WILLIAMSBURG BRIDGE

erected over the Niagara River by the Michigan Central Railroad in 1882. The total length of this bridge is 910 feet; the span between the towers is 470 feet, and the bridge is 245 feet above the river. Other noted bridges of this type are that over the Saint John's, in New Brunswick; that over the Hudson, at Poughkeepsie; that over the Mississippi, at Memphis, and that over the Firth of Forth, in Scotland. The largest cantilever bridge ever projected was that to span the Saint Lawrence above Quebec, having a central span of 1800 feet. Before it was completed this bridge fell, ruining the structure and causing the loss of 74 lives.

Suspension Bridges. A suspension bridge has a platform swung on cables which pass over towers, and are anchored at the abutments. The first modern suspension bridge in England was built about 1819. The great Suspension Bridge over the Niagara River, completed in 1854, marked an epoch in bridge-building and in the history of the country. This was the first great railroad bridge in America and was likewise the beginning of the westward extension of great railway systems. This bridge had a span of 821 feet and a width of 15 feet; it had two decks, the upper containing two railway tracks, and the lower a carriage road and sidewalks. Each deck was supported by two cables 10½ inches in diameter containing 14,040 wires each. The platforms were held in position by being attached to the cables by small cables of a similar make. In 1897 this bridge was replaced by one of the steel-arch type. A suspension bridge nearer the falls, and carrying a carriage road and sidewalks, was also replaced by a steel arch in 1898. This bridge long had the distinction of having the longest arch in the world, its span being 840 feet. Suspension bridges are now common in Great Britain and Europe. The Brooklyn Bridge, over East River, connecting the cities of New York and Brooklyn, is one of the most celebrated suspension bridges. This bridge was completed in 1883. The Brooklyn Bridge, however, is exceeded in magnitude by the Williamsburg or East River Bridge, located about one and one-half miles farther up the river and completed in 1903. The central span of the East River Bridge is 1600 feet between towers, and the land span at each end is 596 feet; it has an approach 2500 feet long on the New York side, and one 1750 feet long on the Brooklyn side. The entire height of the towers is 335 feet; the platform is 110 feet wide and provides on its upper deck for an elevated railway track, two footpaths and bicycle paths, while the lower deck is to contain two electric railway tracks on each side of the elevated railway, and a driveway. The platform is supported by four cables, each 17 inches in diameter, and containing 10,397 No. 8 steel wires each.

Drawbridges. Drawbridges are so constructed that they can be opened to admit of the passage of vessels. The draw may constitute the entire bridge, or it may be only a single span in a long bridge. Drawbridges are of three types: the swing bridge, consisting of a span supported on a center pier and revolving on a turntable; a lift bridge, so constructed that it can be raised to a sufficient height to allow vessels to pass under in the clear, and a lift bridge of the bascule type. The bascule bridge is adapted to narrow channels, where a center pier would obstruct navigation, and is gaining favor as a drawbridge over canals. In a bridge of this type the span is made in two parts of equal length. When the bridge is closed, these parts form a complete arch. Each part is balanced on a shaft to a nearly vertical position, when it is desired to open the bridge, leaving the channel clear.

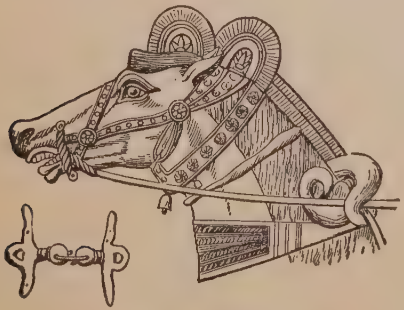
Bridge′port, Conn., one of the county-seats of Fairfield co., 18 mi. s. w. of New Haven and 56 mi. n. e. of New York City, on the Bridgeport harbor, which is an arm of Long Island Sound, and on the New York, New Haven & Hartford railroad. The city has many churches, public, charitable and educational institutions. Bridgeport is an important manufacturing city, with a considerable coasting trade. The principal products are sewing machines, ammunition, hardware, cutlery, carriages and various iron, steel and rubber goods. The place was first settled about 1639, was incorporated as the borough of Bridgeport in 1800 and was chartered as a city in 1836. Population in 1910, 102,054.

Bridge′ton, N. J., the county-seat of Cumberland co., 38 mi. s. of Philadelphia, Pa., on the Cohansey River and on the New Jersey Central and the West Jersey & Seashore railroads. The city was a place of considerable importance long before the Revolution, but it was not incorporated till 1864. It is in a fertile region, manufactures glass, machinery and other articles, and has large fruit and vegetable canning interests. The educational institutions include the South Jersey Institute, the West Jersey Academy and Ivy Hall Seminary. Population in 1910, 14,209.

Bridge′town, the capital of the West Indian island of Barbados, situated on Carlisle Bay, on the western coast of the island. It stretches along the coast for a distance of nearly two miles and contains many beautiful villas surrounded by trees. The principal buildings are the Church of Saint Michael, Church of Saint Mary and the Jewish synagogue. The city also contains an excellent market place, a barracks and Trafalgar Square, in which there is a bronze statue of Lord Nelson. Bridgetown has suffered severely several times from fires. The city was founded during the last half of the seventeenth century under the name of Indian Bridge. The population exceeds 21,000.

Bridge'water, Mass, a town in Plymouth co., 27 mi. s. of Boston, on the New York, New Haven & Hartford railroad. It has a town library, a state normal school, a state farm and almshouse, and contains manufactures of nails, boots, shoes, brick and other articles. The place was settled in 1645 and was called Nunckctest until its incorporation in 1656. Population in 1910, 7688.

Bridg'man, Laura Dewey (1829–1889), a remarkable blind deaf-mute. At the age of two a severe illness deprived her of sight, hearing and speech, and to some extent, also, of smell and taste. She was placed in the Perkins Institution for the Blind, Boston, at the age of eight, and Dr. Howe undertook her education. She made rapid progress and acquired a knowledge of geography and arithmetic, learned to do household work and to sew, both by hand and on the machine. After receiving her education, Miss Bridgman taught in the Perkins Institution.



ANCIENT BRIDLE AND BIT

Bri'dle and Bit, that part of a horse's harness which is attached to the head and mouth, by means of which he is governed and restrained. The proper bitting of horses has been a matter of much study, and innumerable kinds of bits have been introduced for the purpose. The ordinary single riding bridle has a snaffle bit. There are several forms of the snaffle bit. The common riding form is a round, smooth bit, jointed in the middle, attached at either side to bars or checks, which prevent the bit from being pulled through the horse's mouth, and having rings to which the reins and cheek-pieces of the headstall are fixed. The twisted snaffle has the mouthpiece twisted or fluted. The ring snaffle is made without checks; and the rings for headstall and reins are not fixed, but work loose in holes at the ends of the mouthpiece. The double bridle is generally used in the hunting field and often for ordinary purposes. Among the Arabs and in South America and some parts of Mexico and Texas, a heavy, old-fashioned and terribly cruel curb bit is used. On the other hand, the stockmen of Australia employ the plain snaffle bridle alone. It is interesting to know that in the representations of harnessed horses in the Assyrian sculptures, the bridle generally shown is apparently almost identical with the modern snaffle.

Brig'andage, the system of robbery by bands of men in secluded spots on highways or in mountains. It is of very ancient origin, but it has always flourished especially in those countries which had loose governments. In British history the most celebrated brigand was Robin Hood, and in later times Dick Turpin, while in Germany the so-called robber barons attained special fame. For years they practically held the southern part of the country at their mercy and were not effectually crushed until after the Thirty Years' War. Spain has always been a particularly favorable field for outlaws, of whom Don José Maria, whose name is perpetuated in Merimee's *Carmen*, was probably the most famous. In more recent times the brigands have prospered more especially in Italy, where Fra Diavolo, the monk bandit, practiced his profession. In very recent times a peculiar type of brigandage, combining patriotism and robbery, has grown up. It was brigands of this class who kidnaped Miss Ellen Stone and her companion in 1901 in Macedonia and held them for a large ransom, which was finally paid by the United States. It is now plain that these brigands were the close allies, if not the paid agents, of the famous Macedonian committee, which is seeking to secure the independence of the country and used this method of securing funds. Brigandage in the United States has taken the form chiefly of train robberies, and though such crimes are becoming constantly more rare as the western states become more closely populated, they still are common, especially in the passes of the Rocky Mountains. The most famous of all of American brigands was Jesse James.

Bright, JOHN (1811–1889), an English orator and statesman. He first became known as a leader in the Anti-Corn-Law League (See CORN LAWS). In 1843 he was chosen a member of Parliament for Durham, and there he distinguished himself as a strenuous advocate of free trade and reform. He was in 1857 returned for Birmingham, and soon afterward he made speeches against the policy of great military establishments and wars of annexation. During the American Civil War he was one of the few English statesmen who were outspokenly in favor of the Union cause. In 1865 he took a leading part in the movement for the extension of the franchise and strongly advocated the necessity of reform in Ireland. The disestablishment of the Irish Church and the control of India by the crown were subjects which interested him greatly. The influence which Bright maintained throughout his Parliamentary career was due to his high moral character rather than to great intellectual power.

Brighton, *bri'ton,* a maritime town and watering-place in England, in the county of Sussex, 47 mi. s. of London. In front of the town is a massive sea wall, with a promenade and drive over 3 miles in length, one of the finest in Europe. Brighton has no manufactures, but it is especially famous as being the most fashionable watering-place in England. It owes its rise to the partiality shown it by George IV, when prince of Wales. Population in 1901, 123,478.

Bright's Disease, a name given to various forms of kidney disease. The urine in such cases contains albumen and is of less specific gravity than usual. The disease is accompanied with uneasiness or pain in the loins, pale countenance, disordered digestion, frequent urination and dropsy. Blood poisoning may follow, and in the end it often gives rise to the brain disturbance which is the frequent cause of death. The common form of the disease was first described by Dr. Richard Bright in 1827.

Brim'stone, a name for sulphur. Sulphur, in order to purify it from foreign matters, is generally melted in a close vessel, allowed to settle, then poured into cylindrical molds, in which it becomes hard, and is known in commerce as *roll brimstone.*

Brindisi, *breen'de se,* (the ancient Latin town, Brundusium), a seaport and fortified town in the province of Lecce, southern Italy, on the Adriatic, 45 mi. e. n. e. of Taranto. In ancient times Brundusium was an important city, and with its excellent port it became a considerable naval station of the Romans. Its importance as a seaport declined in the Middle Ages and was subsequently completely lost and the harbor blocked, until in 1870 the Peninsular and Oriental Steam Navigation Company put on a weekly line of steamers between Brindisi and Alexandria for the conveyance of mail and passengers between Europe and the East. From this cause, and from the construction of the Suez Canal, Brindisi has suddenly risen into importance. Population in 1901, 23,005.

Brin'ton, DANIEL GARRISON (1837–1899), an American archaeologist and ethnologist. He was born in Pennsylvania, graduated from Yale and studied medicine at Jefferson Medical College and in Paris. During the Civil War he served in the Union army as a surgeon, and after the close of the struggle he was editor for twenty years of the *Medical and Surgical Reporter.* He was professor of ethnology at the Philadelphia Academy of Natural Sciences and also held a chair in the University of Pennsylvania. Among his works are the *Myths of the New World, American Hero Myths, The American Race* and *Religions of Primitive Peoples.*

Brisbane, *briz'bane,* a city in Australia, the capital of Queensland, situated on the Brisbane River. Communication with European and Australian cities is by means of rail and steamship lines. The city possesses some fine buildings, among which are the Houses of Parliament, the postoffice, a technical college and the viceroyal lodge. Brisbane is the seat of an Anglican and a Roman Catholic bishop. Originally established as a penal colony, the city gradually grew in commercial importance, and in 1859 it was incorporated. Population in 1901, 119,428.

Bristles, *bris's'lz,* the stiff, coarse, glossy hairs of the hog and the wild boar, especially the hair growing on the back; extensively used by brushmakers, shoemakers and saddlers. The market is supplied by the meat packing houses and by importations from Russia and Germany. Russia supplies the finest qualities, which are worth about $250 or $300 per hundred pounds. See BRUSH.

Bris'tol, a cathedral city of England, situated partly in Gloucestershire, partly in Somersetshire, 8 mi. from the Bristol Channel, but forming a county in itself. The town is built partly on low grounds, partly on eminences, and has some fine suburban districts, such as Clifton, on the opposite side of the Avon, and connected with Bristol by a suspension bridge 703 feet long and 245 feet above high-water mark. The most notable public buildings are the cathedral, founded in 1142, the Church of Saint Mary Redcliff, said to have been founded in 1293 and perhaps the finest parish church in the kingdom, the guild hall, the museum and the library. Bristol has glass works, potteries, soap works, tanneries, sugar refineries, chemical works, shipbuilding yards and machinery works. Coal is worked extensively within the limits of the borough. The export and import trade is large and varied, and the city is one of the most important ports of Great Britain. There is a harbor in the city itself, and the construction of new docks at Avonmouth and Portishead has given a fresh impetus to the trade. The Saxons called this place Bricgstow (bridge place). In 1373 it was constituted a county of itself by Edward III and was made the seat of a bishopric by Henry VIII in 1542 (now united with Gloucester). Sebastian Cabot, Chatterton and Southey were natives of Bristol. Population in 1901, including Clifton, 328,945.

Bristol, Conn., a borough in Hartford co., 18 mi. s. w. of Hartford, on the New York, New Haven & Hartford railroad. It has a public library, electric lights and street railroads, and it contains manufactures of clocks, brass goods, tools, knit goods and other articles. The place was incorporated as a town in 1785, and as a borough in 1893. Population in 1910, 9527.

Bristol, Pa., a borough in Bucks co., 21 mi. n. e. of Philadelphia, on the Delaware River, the Pennsylvania canal and the Pennsylvania railroad. It is in a rich fruit and truck-farming region, has foundries, rolling mills and extensive manufactures of carpets, textile goods, wall paper and patent leather. Bristol was settled in 1681 and was originally called Buckingham. A ferry connects it with Burlington, on the New Jersey side of the river. Population in 1910, 9256.

Bristol, R. I., the county-seat of Bristol co., 15 mi. s. e. of Providence, on Narragansett Bay and on the New York, New Haven & Hartford railroad. The town has an excellent harbor and large ship-building yards, and it contains manufactures of rubber, woolen and cotton goods. It has a fine, large public library and eight churches. The place was first settled by the whites about 1675 and was incorporated as a town in 1746. Population in 1910, 8565.

Bristol, Tenn., a city in Sullivan co., on the Southern and the Norfolk & Western railroads. Bristol, Va., forms with it practically one city, for the state line passes down the middle of the main street of the combined municipalities. There are extensive lumber and pulp mills and manufactures of other articles. King's College, Sullins College and the Southwest Virginia Institute for young ladies are located here. Population in 1910, in Tennessee, 7148, and including that portion in Virginia, 13,395.

Bristol Chan'nel, an arm of the Irish Sea indenting the coast of Great Britain between Wales and the southern peninsula of the island. It is about 80 mi. long and varies in width from 5 to 50 mi., having a shore line of 220 mi. It receives the waters of the Usk, Wye, Severn, Avon and several other rivers. The channel is noted for its high tides, which in the narrowest places sometimes rise 40 feet. Lundy Island is situated at the entrance.

Bris'tow, Banjamin Helm (1832–1896), an American politician and reformer, born in Elkton, Ky. He began the practice of law in his native state, entered the Union army at the beginning of the Civil War and rose to the rank of colonel. In 1870 he was appointed United States solicitor general and from 1874 to 1876 was secretary of the treasury, being active in the prosecution of the Whisky Ring. This fame made him a prominent candidate for the Republican nomination for president in 1876, but he was defeated by Hayes. In the same year he removed to New York, where he gained a large legal practice.

Britannia Tubular Bridge. See Bridge, subhead *Tubular Bridges.*

Brit'ish Amer'ica, the name formerly applied to that portion of North America north of the United States and east of Alaska, including Newfoundland. Since the formation of the Dominion of Canada, the term is restricted to Newfoundland, the Bermudas, British Honduras, the British West India Islands, British Guiana and the Falkland Islands. The term is now seldom used.

British Association for the Advancement of Science, a society organized in 1831, mainly through the exertions of Sir David Brewster, whose object was to assist the progress of discovery and to disseminate the latest results of scientific research, by bringing together men eminent in all the several departments of science. Its first meeting was held at York on Sept. 26, 1831. Since then it has met annually in different parts of the United Kingdom and twice in Canada, in Montreal in 1884 and Toronto in 1897. The sessions extend generally over about a week. The society is divided into sections, which, after the president's address, meet separately for the reading of papers and for conference. Lectures and other general meetings are usually held each evening during the meeting of the association. The yearly revenue of the association is more than sufficient to meet its expenses, and the surplus is appropriated for the pursuit of various lines of scientific investigation.

British Cen'tral Af'rica, a British colony, situated in the east central portion of Africa, bounded on the n. by Kongo State and German East Africa, on the e. by Lake Tanganyika, on the s. by Portuguese East Africa and on the w. by Kongo State. It is really an extension of Rhodesia. The area is about 40,980 square miles, and the population is estimated at between 900,000 and 1,000,000, less than 500 of whom are Europeans. The climate is salubrious, and the chief crops are wheat, oats, barley and coffee. Since the colony has come under British rule it is being rapidly opened to civilization. See RHODESIA.

British Colum'bia, a province of the Dominion of Canada, bounded on the n. by Yukon and Mackenzie, on the e. by Alberta, on the s. by the United States and on the w. by the Pacific Ocean and Alaska. Its length from north to south is 740 miles, and its greatest length from east to west, 620 miles. The area, including islands, is 312,630 square miles, or about equal to that of California and Arizona combined.

SURFACE AND DRAINAGE. With the exception of the northeastern corner, the province is mountainous. The main range of the Rocky Mountains, extending its entire length from northwest to southeast, forms a portion of the boundary between British Columbia and Alberta. To the west of this portion of the Rocky Mountains, and extending nearly parallel with them, are the Selkirk and Gold ranges, and a little to the north of the Selkirks are the Caribou Mountains. Between these ranges are deep valleys (See SELKIRK MOUNTAINS). Extending through nearly the middle portion of the southern half of the province is the northern extremity of the Cascade Range, and the Coast Range extends along the coast, its spurs forming most of the numerous islands. All of these ranges diminish in altitude toward the north, and before reaching the northern boundary some of them disappear. The southeastern portion is unusually mountainous, and between the ranges are found a number of long, narrow lakes, which are really expansions of the rivers. The most important of these are Okanagan, Arrowhead and Kootenay. The surrounding mountains have altitudes ranging from 8000 to 10,000 feet and are covered with snow throughout the year.

The principal rivers are the Columbia, which drains the southeastern portion, the Frazer, which traverses the province for a distance of 750 miles, and the Skeena and Stikine, all of which flow into the Pacific and are navigable for large boats in the lower parts of their courses. The northeastern portion of the province is drained by the Peace and the Liard rivers, which find an outlet through the Mackenzie.

CLIMATE. British Columbia has on the whole a milder climate than other provinces in the same latitude. This is due to the warm winds which blow from the Pacific and along the coast and for some distance into the interior. At Vancouver the yearly temperature ranges from about 37° to 60°. East of the Coast Range there is greater difference between summer and winter, and the eastern portion of the province has extremely cold winters and hot summers. The rainfall varies greatly from the coast inland. The Coast Range deprives the winds of much of their moisture, and upon the western slopes of these mountains the annual rainfall varies from 100 inches in the northern part to 40 inches at Victoria, while in the valleys in the interior it is about 15 inches. Lofty ranges of the Selkirks and the Rocky Mountains deprive the atmosphere of still more moisture, and the winters in this region are characterized by deep snows, which remain upon the mountains throughout the year and furnish the source of most of the streams that rise in that locality.

MINERAL RESOURCES. The province is rich in minerals, and mining is the chief industry. Gold was discovered in 1851 and for a number of years was obtained in large quantities from gravel along the river beds After these sources were exhausted, prospectors discovered numerous valuable veins of ore in the southeastern section, or Kootenay district, and mountain mines are now extensively worked. Next to gold, silver is the most important metal mined, followed in value by copper. On Vancouver Island are extensive coal mines, and others are found in the Crow's Nest Pass of the Rocky Mountains.

Agriculture. The soil is fertile, and the plains and valleys are well adapted to the growth of wheat, oats, other cereals and nearly all fruits of the temperate latitudes. Wherever there is sufficient rainfall, agriculture is very successful. In the dry regions stock raising is followed to a considerable extent. Some of the arid regions are successfully irrigated.

Lumbering. The western slopes of the mountain ranges are covered with dense forests of valuable timber trees, chief among which is the Douglas fir, and lumbering is the industry next in importance to mining. There are numerous large mills in the lumber regions, and the annual cut exceeds 100,000,000 feet.

Fisheries. Rivers flowing into the Pacific are abundantly stocked with fish, and during the spawning season of the year quantities of fish from the salt water ascend the streams; consequently, fishing is an important industry, and in this British Columbia ranks second only to Nova Scotia among the provinces. Salmon fishing and canning is extensively carried on along the Frazer River, and the annual output of the fisheries amounts to over $5,000,000.

Transportation. The rivers flowing into the Pacific are navigable for considerable distances, and the mountain lakes in the Kootenay district contain small steamers which ply between various ports. The Canadian Pacific railway crosses the southern portion of the province and terminates at Vancouver. This line has two spurs extending to railway systems in the United States, and several extending northward. The Grand Trunk Pacific system, when completed, will furnish the center and northern portions with railway communication with the coast and with the East. Most of the towns in the interior have to depend upon stage lines for mail and passenger transportation.

Education. The province maintains an excellent system of public schools, which are entirely under secular control and which receive government aid in proportion to attendance. There are also numerous private schools and high schools.

Government. British Columbia's local government consists of a legislature, elected by popular suffrage, and an executive council. The chief executive is the lieutenant governor, appointed by the Dominion government. See Dominion of Canada, subhead *Government.*

Cities. The leading cities are Victoria, the capital, Vancouver, Nannaimo, Nelson, New Westminister and Rossland, each of which is described under its title.

Population in 1909, 341,000, of which 25,000 were indians.

British East Africa, a British colony situated in the east central portion of Africa, bounded on the n. by the British Sudan and Abyssinia, on the e. by Italian Somaliland and the Indian Ocean, on the s. by German East Africa and on the w. by Kongo State. It also includes the islands of Zanzibar and Pemba. The area is over 1,000,000 square miles, and the population, exclusive of islands, is estimated at over 5,000,000, less than one-half of whom are Europeans. The country is watered by the Upper Nile and contains a portion of Victoria Nyanza, Albert Nyanza and Lake Rudolph. The plains contain a rich growth of grass and are well suited to grazing. The minerals include iron and copper in abundance. The principal exports are ivory, rubber, gums, hides and cattle. A railway extends from Mombasa, on the coast, to Port Florence, on Victoria Nyanza, in the Uganda region. The important cities are Mombasa and Zanzibar. See Uganda.

British Guiana, *ge ah'na.* See Guiana.

British Honduras or **Belize,** a colony of Great Britain, in the northeastern part of Central America, bounded on the e. by the Caribbean Sea, on the s. by the Gulf of Honduras, on the s. and s. w. by Guatemala and on the n. by Mexico. It has an area of 7562 square miles. The coast is low and swampy, and the climate is hot and moist. There are large forests of mahogany and logwood, and the soil is in many parts fertile, the chief products being coffee, bananas and cocoanuts. The exports consist of woods, fruit, rubber and sugar, and about one-half of the trade is carried on with Great Britain. The capital is Belize. The government is in the hands of a governor, assisted by an executive and a legislative council, all appointed by the sovereign of Great Britain. The first settlement was made at the beginning of the eighteenth century. Spain attempted at different times to expel the settlers, but in 1783, by a treaty, the sovereignty of Great Britain was recognized. It became a separate colony in 1884.

British Isles, the archipelago off the western coast of Europe, surrounded by the British Channel, the Strait of Dover, the North Sea and the Atlantic Ocean. It includes the islands of Great Britain, Ireland, the Hebrides, the Orkneys and the Channel Islands. See Great Britain.

British Muse′um, the great national museum in London, founded by Sir Hans Sloane, who, in 1753, bequeathed his various collections, including 50,000 books and manuscripts, to the nation, on the condition of $100,000 being paid to his heirs. Montague House was appropriated for the museum, which was first opened on January 15, 1759. The original edifice having become inadequate, a new building in Great Russell Street was resolved upon in 1823, but was not completed till 1847. In 1857 a new library building was completed and opened at a cost of $750,000. It contains a circular reading-room 140 feet in diameter, with a dome 106 feet in height. This room contains accommodation for 200 readers comfortably seated at separate desks, which are provided with all necessary conveniences. More recently, the accommodation having become again inadequate, it was resolved to separate the objects belonging to the natural history department from the rest, and to lodge them in a building by themselves. Accordingly, a large natural history museum has been erected at South Kensington, and the specimens pertaining to natural history, including geology and mineralogy, have been transferred thither, but they still form part of the British Museum. Further additions to the Great Russell Street buildings were made in 1882, and again in 1888. The museum is under the management of forty-eight trustees. It is open daily, free of charge. Admission to the reading room as a regular reader is by ticket, procurable on application to the chief librarian and by complying with certain simple conditions. The library, which is now the second largest and one of the most valuable in the world, has been enriched by numerous bequests and gifts, among others the library collected by George III during his long reign. A copy of every book, pamphlet, newspaper, piece of music, etc., published anywhere in British territory, must be conveyed free of charge to the British Museum. The museum contains eight principal departments, namely, the department of printed books, maps, charts, plans, etc.; the department of manuscripts; the department of natural history; the department of oriental antiquities; the department of Greek and Roman antiquities; the department of coins and medals; the department of British and medieval antiquities and ethnography, and the department of prints and drawings. The total number of persons using the reading-rooms each year is about 200,000, and the annual number of visitors, exclusive of readers, is about 700,000.

British South Africa. See Rhodesia.

Brit′tany or **Bretagne,** *bre tahn′y′*, a peninsula projecting into the Atlantic, between the British Channel on the n. and the Bay of Biscay on the s., and forming the extreme western portion of France. Brittany is supposed to have taken its name from the ancient Britons, who sought refuge here when driven from the island of Britain. It was formerly an independent kingdom, then a duchy of France. It is now a province of France and is subdivided into five departments. The soil is rather poor, and only meager crops are grown. Of these, corn, grapes and other fruits are the most important. The inhabitants along the coast engage in the manufacture of salt, and coal, lead and iron are found in small quantities in the interior. The fisheries are quite important. Many remains of the ancient inhabitants are found throughout the country, and the native peasantry retain their ancient language, which closely resembles the Welsh. See France.

Bri′za, a genus of grasses, commonly called quaking grass, maiden's hair or lady's tresses. There are about thirty species, chiefly found in South America, but several species are cultivated here as ornamental plants.

Broad Ar′row, a government mark placed on British stores of every description, to distinguish them as public or crown property. To obliterate or deface the mark is felony, and persons found in possession of goods marked with the broad arrow forfeit the goods and are subject to a penalty.

Broad′sword, a sword with a broad blade, designed chiefly for cutting, formerly used by some regiments of cavalry and Highland infantry in the British service. The claymore, or broadsword, was the national weapon of the Highlanders.

Brocade, *bro kade′*, a stuff of silk, enriched with raised flowers, foliage or other ornaments. The term is restricted to silks figured in the loom, distinguished from those which are embroidered after being woven. Brocade was manufactured in Oriental countries at an early date and in Europe as early as the thirteenth century.

Brock, Sir Isaac (1769–1812), a British soldier. He became lieutenant in 1790, served in the West Indies, in Holland and at the Battle of Copenhagen, and in 1802 went to Canada, where he suppressed a troublesome conspiracy. In 1810 he commanded the troops in Upper Canada and became lieutenant governor of that province. General Brock moved his command to Detroit in 1812, and in August he captured General Hull with his entire army. Meanwhile, a United States force was gathered on the frontier of Niagara, and in his attack on this force General Brock fell. A magnificent monument has been erected to him at the spot where he was killed in Queenstown.

Brock'en, the highest summit of the Harz Mountains in Prussian Saxony, celebrated for the atmospheric conditions which produce in the clouds the appearance of gigantic spectral figures, which are only shadows of the spectators projected by the morning or evening sun. It is 3747 feet high.

Brock'ton, Mass., a city in Plymouth co., 20 mi. s. of Boston, on the New York, New Haven & Hartford Railroad. It is the greatest center for making men's shoes in America. Its other products include shoe machinery and supplies, tools, automobiles, motor-cycles and rubber goods. The place was settled in 1700 and was incorporated in 1821 as North Bridgewater. The present name was adopted in 1874. Population in 1910, 56,878.

Brock'ville, a city of Ontario, Canada, situated on the Saint Lawrence River and on the Grand Trunk railway, 40 mi. n. e. of Kingston and 125 mi. s. w. of Montreal. The most important industries include the manufacture of steam engines, agricultural implements, tools, gloves and chemicals. Brockville is a port of call for the steamers passing down the Saint Lawrence, and on account of rapids in the river canals have been constructed to facilitate navigation at this point. The city was named for General Isaac Brock. Population in 1901, 8940.

Bro'ken Wind or **Heaves,** a disease in horses, often accompanied with an enlargement of the lungs and heart, which disables them for bearing fatigue. In this disease the expiration of the air from the lungs occupies double the time that the inspiration does and requires also two efforts, one rapidly succeeding the other. It is caused by rupture of the air cells, and there is no known cure for it.

Bro'ker, an agent who is employed to conclude bargains or transact business for others, in consideration of a charge or compensation, which is usually in proportion to the extent or value of the transaction completed by him, and is called his *commission* or *brokerage*. In large mercantile communities the business of a broker is usually limited to a particular class of transactions, and each class of brokers has a distinctive name, as *bill broker,* one who buys and sells bills of exchange for others; *insurance broker,* one who negotiates between underwriters and the owners of vessels and shippers of goods; *ship broker,* one who is the agent of owners of vessels in chartering them to merchants or procuring freight for them from one port to another; *stock broker,* the agent of dealers in shares of joint stock companies, government securities and other monetary investments.

Bromine, *bro'min,* a non-metallic element discovered in 1826. In its general chemical properties it much resembles chlorine and iodine, and it is usually associated with them. It exists, but in very minute quantities, in sea water, in the ashes of marine plants, in animals and in some salt springs. At common temperatures it is a very dark reddish liquid, emitting a red vapor and having a powerful and suffocating odor. It has bleaching powers like chlorine, and it is very poisonous. Its density is about four and a half times that of water. It combines with hydrogen to form *hydrobromic acid. Bromide of potassium* has sedative and other properties and is used by physicians in cases of scrofula, goiter, rheumatism and other diseases. *Bromide of silver* is used in photography. With oxygen and hydrogen bromine forms *bromic acid.*

Bronchi, *bron'ki,* the two branches into which the trachea, or windpipe, divides in the chest, one going to the right lung, the other to the left. They divide and subdivide into countless small tubes, known as bronchial tubes. They are lined with a mucous membrane, and at the extremity of each tiny tube is a cluster of air cells. See Lungs; Respiration.

Bronchitis, *bron ki'tis,* an inflammation of the mucous membrane of the bronchial tubes, or the air passages leading from the trachea to the lungs. It is of common occurrence and may be either acute or chronic. Its symptoms are those of a feverish cold, such as headache, lassitude and an occasional cough, which are succeeded by a more frequent cough, occurring in paroxysms, a spit of yellowish mucus and a feeling of great oppression on the chest. Slight attacks of acute bronchitis are frequent and not very dangerous. They may be treated with mustard poultices or fomentations. Acute bronchitis, however, may become a formidable malady and requires prompt treatment. Its main symptoms are cough, shortness of breath and spit. It is particularly apt to attack a person in winter, and in the end it may cause death by preventing the lungs from doing their work and by causing other complications.

Brontë, *bron ta'*, CHARLOTTE (afterwards Mrs. Nicholls) (1816–1855), an English novelist. After an education received partly at home and partly at neighboring schools, Miss Brontë became a teacher and then a governess. In 1842 she went with her sister Emily to Brussels, with a view of learning French and German, and she afterward taught for a year in the school she had attended there. Her experiences at this school she described later in *Villette.* Obliged to support themselves, and finding school teaching impossible because it kept them from home, the three sisters, Charlotte, Emily and Anne, turned their attention to literary composition; and in 1846 a volume of poems by the three sisters was published, under the names of Currer, Ellis and Acton Bell. It was issued at their own risk and attracted little attention, so they gave up poetry for prose fiction, and each porduced a novel. Charlotte (Currer Bell) wrote *The Professor,* but it was everywhere refused by publishers and was not given to the world till after her death. This failure, however, did not discourage her, and she continued her work on *Jane Eyre,* which was published in 1847. Its success was immediate and decided. Her second novel, *Shirley,* appeared in 1849, and in 1852 appeared *Villette.* Meanwhile Charlotte had lost her two sisters and her brother, and her life, never happy, became one of almost unbroken gloom. In 1854 she married her father's curate, the Rev. Arthur Nicholls, and she had a few happy months before her death in 1855. Mrs. Gaskell, in her *Life of Charlotte Bronte,* makes the reader see very clearly the dreariness of the Brontë home and the monotonous gloom of Charlotte's life.

Bronze, an alloy of copper and tin in varying proportions, with occasionally the addition of small quantities of lead or zinc. The most common varieties of bronze in use are gun metal, used in making ordnance (See ARTILLERY; CANNON); bell metal (See BELL); specular metal, used for making mirrors and reflectors in telescopes; statuary bronze, used in sculpture; aluminum bronze, a composition of copper and aluminum, closely resembling gold, and manganese bronze, often called white bronze, a composition of iron and manganese with other bronzes. *Gun metal* contains nine parts copper and one part zinc. It is very hard and strong. *Bell metal* for large bells consists of three parts copper to one part tin, and for small bells, four parts copper to one part tin. *Statuary bronze* contains eight parts copper to two parts tin. Japanese bronzes contain quite a large proportion of lead, which makes them softer. They also contain some nickel, arsenic, silver and gold.

Bronze has been known from a very early period of history. The Chinese and ancient Egyptians were familiar with it centuries before the Christian era, and it is supposed that their early bronzes were produced by smelting the ores of the metals. Bronze is used for a great variety of purposes in the arts, also for ornamental work, such as railings and other structures. See BRONZE AGE.

Bronze Age, a term denoting the period or stage of culture of a people using bronze as the material for implements and weapons. As a stage of culture, the use of bronze comes between the use of stone and the use of iron. The Bronze Age is not an absolute division of time, but a relative condition of culture, which in some places may have been reached early, in others late; in some it may have been prolonged, and in others brief, or even, as in the Polynesian area, it may not have existed, in consequence of the people passing directly from the use of stone to that of iron. The implements and weapons of the Bronze Age include knives, saws, sickles, awls, gouges, hammers, anvils, axes, swords, daggers, spears, arrows, shields. The composition of the bronze varied considerably, but in general it was about ninety per cent of copper to ten per cent of tin. See STONE AGE; IRON AGE.

Brooch, *brohch,* an ornamental pin used for fastening the dress, or for ornament only. It has a pin passing across it, which is fastened at one end with a joint, and at the other with a hook. Brooches were worn by both men and women in Greece and Rome and in Europe up to the time of the Middle Ages. They often bore inscriptions, and it is an interesting fact that the oldest example of Latin now in existence is inscribed on a brooch. Brooches were often used, also, as a kind of amulet or talisman.

Brook Farm, a socialistic community founded at West Roxbury, Mass., in 1841, under the inspiration of George Ripley. At different times in the course of its career some of the most distinguished of Americans were connected with it, among them Nathaniel Hawthorne, George W. Curtis, Charles A. Dana, Margaret Fuller and Ralph Waldo Emerson. The industrial system of the community was one of "brotherly coöperation." All members, regardless of sex, were required to labor a certain period each day, the products being turned in to a common stock, from which all shared practically equally. Financial difficulties, however, soon led to its decline, some of the most distinguished members of the community became discouraged and withdrew, and finally some of its most important buildings were destroyed by fire. It was dissolved in October, 1847. Hawthorne's *Blithedale Romance* contains, under the guise of fiction, many of the author's experiences at Brook Farm. See COMMUNISM; TRANSCENDENTALISM.

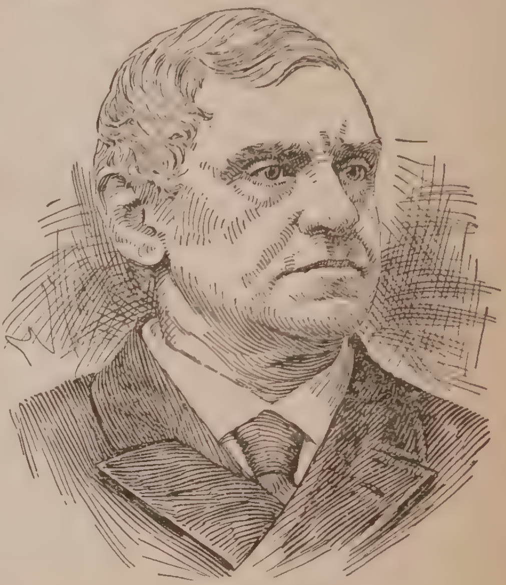
Brook'field, Mo., a city in Linn co., 100 mi. e. of Saint Joseph, on the Chicago, Burlington & Quincy railroad. The industries include railroad shops, iron works, lumber and flour mills and brick yards. Coal is mined in the vicinity, and together with farm produce and live stock it produces a considerable trade. The place was settled about 1860. Population in 1910, 5749.

Brook'line, MASS., a town in Norfolk co., about 3 mi. w. of Boston, on the Boston & Albany railroad. It is one of the wealthiest and most beautiful residence suburbs of Boston. Riding Academy is located here, and the town has a large public library. There are also some manufactures of electrical appliances and other articles. It was settled in 1635 and was known as the "Hamlet of Muddy River" until 1705, when it was incorporated as Brookline. Population in 1910, including the villages of Cottage Farm, Longwood and Reservoir Station, 27,792.

Brook'lyn, a borough of New York City, formerly the county-seat of Kings co. and second-largest city of New York, is situated on the west end of Long Island and is separated from the borough of Manhattan by East River. Brooklyn is characterized by its broad, straight streets, numerous shade trees, extensive river front and many magnificent churches and residences. Along the water front are extensive sugar refineries and other factories. Brooklyn is connected with Manhattan by the Brooklyn and East River bridges and by numerous lines of ferries. In 1898 it was made a part of Greater New York. See NEW YORK (City).

Brooklyn Bridge. See BRIDGE, subhead *Suspension Bridges*.

Brooks, PHILLIPS (1835–1893), an American bishop of the Protestant Episcopal Church, born at Boston and educated at Harvard and at the Theological Seminary, Alexandria Va. He was the rector of the Church of the Advent and later of the Holy Trinity Church in Philadelphia. After serving as rector of Trinity Church in Boston he was appointed bishop of Massachusetts in 1891. Brooks was celebrated not only as a popular and powerful preacher, but as a vigorous and independent thinker and a polished orator. Among his publications are *Lectures on Preaching*, *The Influence of Jesus* and several volumes of sermons. He also is the author of the popular Christmas hymn, *Oh, Little Town of Bethlehem.*



PHILLIPS BROOKS

Brooks, PRESTON SMITH (1819–1857), an American politician. He became a member of Congress from South Carolina in 1853 and attained an unenviable notoriety in May, 1856, by making a brutal assault upon Charles Sumner in the United States Senate chamber.

Broom, the name of several plants of the pea family. The common broom of Europe is a bushy shrub, with straight, angular branches of a dark-green color, and flowers of a deep golden yellow. Its twigs are often made into brooms and are used in thatching houses and cornstacks. The whole plant has a very bitter taste.

Broom, an article for sweeping floors, usually made of broom corn. The corn is sorted as to size, then dried and sent to the factory in bales. The handle of the broom is a turned stick about four feet long and enlarged at the end to which the brush is fastened. The corn is bound to the handle with wire. The broom is flattened in a vise and sewed. The ends are then trimmed until they are even, and the brooms are tied in packages of one dozen, ready for the market. The work is mostly done by hand and is suitable for small shops, individual enterprises and penitentiaries. Broom making is also quite a common trade for the blind. Whisk brooms are made in a manner similar to the large brooms, but they are of finer material and often have fancy handles. See BROOM CORN.

Broom Corn or **Broom Grass**, a grass with a jointed stem, growing to a height of eight or ten feet, extensively cultivated in the United States, where the branched panicles are made into carpet brooms and clothes brushes. Before the plant matures, the stem is broken over about eighteen inches from the top and allowed to hang until the seed ripens. Then the head is cut off, the seeds are removed and the heads cured in the shade.

Broth'erhood of An'drew and Phil'ip, THE, was founded in 1888 and is composed of members of twenty-three evangelical denominations. "Any man can belong to the Brotherhood who will promise to pray daily for the spread of the kingdom of Christ among men, and to make an earnest effort each week to bring at least one man within the hearing of the Gospel." There are 875 chapters in the United States, with 25,000 members, and there are also chapters in Australia and Japan.

Brotherhood of Saint Andrew, THE, a religious organization, started as a parish guild in Saint James Episcopal Church, Chicago, in 1883. The object of the organization was "the spread of Christ's kingdom among young men." The work spread rapidly, and there are now national organizations in the United States, Canada, England Scotland, Australia and the West Indies. In China, Japan, Germany and in Central and South America are chapters affiliated with the American brotherhood. The headquarters are in Pittsburg, Pa. There are now 1200 active chapters, with a membership of 14,000 men. A junior department has 400 chapters in the United States, with about 5000 members.

Brough, *brow*, JOHN (1811–1865), an American journalist and politician, born in Ohio and educated at the state university. He edited several influential Democratic papers and gained a reputation as one of the ablest orators of his party in Ohio. In 1864 he was nominated for governor of the Union party and was elected over Vallandigham by a tremendous majority. For his efficient service to the government during his term, he is known as one of the great "war governors."

Brougham, *broom* or *broo'am*, a four-wheeled carriage, with a single inside seat for two persons, and with a raised driver's seat. The conveyance was named after, and was apparently invented by, Lord Brougham.

Brougham, HENRY PETER, Baron Brougham and Vaux (1778–1868), an English statesman and jurist. Along with Jeffrey, Horner and Sydney Smith, he bore a chief part in starting the *Edinburgh Review* in 1802. He entered Parliament, labored for reforms, and by his fearless and successful defense of Queen Caroline in 1820 he won great popular favor. In the ministry of Earl Grey he accepted the post of lord chancellor, and in this position he distinguished himself as a law reformer and aided greatly in the passing of the Reform Bill of 1832. In legal procedure he secured the correction of various abuses.

Brown, a color which may be regarded as a mixture of red and black, or of red, black and yellow. There are various brown pigments, mostly of mineral origin, as bistre, umber and cappagh brown.

Brown, BENJAMIN GRATZ (1826–1885), an American politician, born in Lexington, Ky. He graduated at Yale in 1847, began the practice of law in Saint Louis and was elected to the legislature. In 1854 he began the publication of the *Missouri Democrat*. During the Civil War he fought in the Union army and became brigadier general of volunteers. He was United States senator from Missouri from 1863 to 1867, and in 1871 he was elected governor of the state. He was prominent in the Liberal Republican movement in 1872, which had its beginnings in Missouri, and was the candidate for vice-president on the ticket headed by Horace Greeley.

Brown, CHARLES BROCKDEN (1771–1810), the first American novelist of any importance. He was educated for the law, but the term intended for preparatory legal study was principally occupied with literary pursuits. His first novel, *Wieland*, was published in 1798. Others of his works are *Mervyn*, *Ormund* and *Clara Howard*. Brown's novels, while in certain respects powerful, are of the highly sentimental, improbable type, and their tendency toward the gloomy and horrible has always kept them from becoming popular.

Brown, Elmore Ellsworth (1861–), an American educator, born in Kiantone, N. Y., and educated in the Illinois State Normal University, University of Michigan and German universities. After filling several public school positions, Mr. Brown was chosen assistant professor of the science and art of teaching in the University of Michigan in 1891. From there he went to the University of California as associate professor of pedagogy, and in 1893 he was appointed as head of the department. In June, 1906, he was appointed commissioner of education for the United States, to succeed William T. Harris, resigned. He is the author of *The Making of Our Middle Schools. Origin of American State Universities* and *Secondary Education,* besides many articles for magazines and reviews.

Brown, George (1818–1880), a Canadian statesman. He was educated in Scotland, came to New York in 1838 and published there the *British Chronicle*. In 1843 he went to Canada, and the following year he issued the first number of the Toronto *Globe*. He sat in the Dominion Parliament from 1851 to 1867, and in 1873 he entered the Senate. He was shot by a discharged employe and died from the effects of the wound.

Brown, Henry Billings (1836–), an American jurist, born at South Lee, Mass. He graduated at Yale, studied law at Yale and Harvard and began practice in Michigan. He became United States district attorney in 1863, was for a time state circuit judge and from 1875 to 1890 was judge of the United States court for the eastern district of Michigan. In 1891 he was appointed associate justice of the United States Supreme Court.

Brown, Henry Kirke (1814–1886), an American sculptor, born in Leyden, Mass. In 1840 he went to Troy and Albany, executing many portrait busts of prominent persons. After spending several years in Italy, he returned to the United States and settled in Brooklyn. Here for two years he was engaged with the statue of De Witt Clinton for Greenwood Cemetery, the first bronze statue cast in America. In 1857 he was invited by South Carolina to make the pediment for the statehouse in Columbia, which, however, was destroyed during the Civil War. It represented a colossal figure of South Carolina, with Justice and Liberty at either side, and Industries, represented by negro slaves, at work in the cotton and rice plantations.

Mr. Brown's principal statues are *Abraham Lincoln,* in Prospect Park, Brooklyn; *Gen. Nathanael Greene,* for the state of Rhode Island, presented to the National Gallery in the capitol, Washington; *Abraham Lincoln,* Union Square, New York; *Equestrian Statue of General Scott,* Scott Circle, Washington, and *Gen. George Clinton,* presented by the State of New York to the United States government.

Brown, Jacob (1775–1828), an American soldier, born in Bucks co., Pa. He removed to New York, taught school and studied law, and then served as military secretary to Alexander Hamilton. He entered the state militia, became brigadier general and early in the War of 1812 was commissioned to defend the frontier. His successes against the British at Ogdensburg and Sackett's Harbor led to his appointment as brigadier general in the United States regular army. He was raised to the rank of major general, and early in 1814 he became commander of the northern department. On July 5 he was responsible for the defeat of the British at Chippewa, and on July 25 he was conspicuous in the victory at Lundy's Lane. From 1821 until his death he was general in chief of the United States army.

Brown, John (1800–1859), an American abolitionist, celebrated as the originator of the Harper's Ferry insurrection. He was born in Torrington, Conn. His early years were spent in travels, apparently aimless and valueless, though at times he displayed in his business affairs the real force of his character. He lived at different times in Connecticut, Ohio and New York, was twice married and was the father of twenty children, for whom he provided only inadequate support.

In 1855, with his four sons, he migrated to Kansas and at once took a prominent position as an antislavery man. He became renowned in the fierce border warfare which was carried on for some years in Kansas and Missouri, and he gained particular celebrity by his victories at Pottawatomie and Osawatomie.

About this time he seems to have formed the idea of effecting slave liberation by arming the slaves and inciting them to rise in revolt against their oppressors. As the first step in this scheme, he designed to seize the arsenal of Harper's Ferry, where an immense stock of arms was kept. On the night of Oct. 10, 1859, he, with a handful of well-armed and resolute companions, including several of his sons, overpowered the small guard and gained possession of the arsenal. During the next morning he made prisoners of some of the chief men of the town, but there was no rising of slaves as he had expected. A squad of United States soldiers under Capt. Robert E. Lee regained control of the arsenal after a short but stubborn fight, in which Brown was severely wounded. On October 27, he was tried at Charlestown for treason and murder, was found guilty and was hanged December 2. His offense was generally condoned in the north, and his execution was condemned. This led the Southerners to become more bitter in their feeling against the antislavery party.

Brown, John (1810–1882), a Scottish physician and writer, educated at the University of Edinburgh. He practiced medicine in Edinburgh and wrote during his leisure hours many essays on medicine, literature and miscellaneous topics. These have been collected in a volume known as *Horae Subsecivae.* He is chiefly remembered for the widely popular *Rab and His Friends.*

Brown, John (1736–1788), author of the Brunonian system in medicine. He maintained that the majority of diseases were proofs of weakness and not of excessive strength or excitement, and therefore contended that indiscriminate lowering of the system, as by bleeding, was erroneous and that supporting treatment was required. His system gave rise to much opposition, but his opinions materially influenced the practice of his successors.

Brown, John George (1831–), an American painter, born in Durham, England. He studied in Newcastle-on-Tyne and in Edinburgh and in 1853 came to America. He was one of the original members of the Water Color Society and was its president in 1901. His portrayals of New York bootblacks and street urchins are especially known. Among his productions are *Hiding in the Old Oak, Pull for the Shore* and *Street Boys at Play.*

Brown, Joseph Emerson (1821–1894), an American lawyer and politician, born in South Carolina. He early removed to Georgia and was elected to the state senate in 1849, became judge in 1855 and was governor from 1857 to 1865. At the outbreak of the Civil War, Governor Brown, who was an active secessionist, seized the United States forts and arsenals, and later he raised an army of 100,000 old men and boys to defend the state against Sherman's raid. After the war he advised his state to accept the terms of reconstruction offered, and for a time he acted with the Republican party. He was appointed chief justice of the state supreme court in 1868. In 1872 he again joined the Democratic party, and in 1880 he was elected United States senator.

Browne, Charles Farrar (1834–1867), an American humorist, best known as "Artemus Ward." Originally a printer, he became editor of papers in Ohio, where his humorous letters became very popular. He subsequently lectured in California and Utah and in England, where he also contributed to *Punch.* His writings consist of letters and papers by Artemus Ward, a pretended exhibitor of wax figures and wild beasts, and are full of drollery and eccentricity.

Browne, Hablot Knight (1815–1882), an English humorist, better known as "Phiz." In 1835 he succeeded Seymour as the illustrator of Dickens's *Pickwick Papers* and other works of Dickens, Lever, Ainsworth and others.

Browne, Thomas, Sir (1605–1682), an English physician and writer. In 1642 he published his *Religio Medici* (A Physician's Religion), which excited the attention of the learned, not only in England but throughout Europe, and was translated into various languages.

Brown′ie, in Scotland, an imaginary spirit formerly believed to haunt houses, particularly farmhouses. He was believed to be very useful to the family, particularly to the servants, for whom he was wont to do many pieces of drudgery while they slept. The brownie bears a close resemblance to the Robin Goodfellow of England and to the Kobold of Germany.

Brown′ing, Elizabeth Barrett (1806–1861), a famous English poet. She grew up at Hope End, near Ledbury, Herefordshire, where her father possessed a large estate. She was always extremely delicate, and she had been injured by a fall from her pony when a girl, but her mind was sound and vigorous and was disciplined by a course of severe and exalted study. She early began to commit her thoughts to writing, and in 1826 she published anonymously a volume entitled *An Essay on Mind, with Other Poems.* In 1840 she received a severe shock from the drowning of her brother, and for a time her life was despaired of. Several years were spent in the confinement of a sickroom, but she was far from idle during this time, and some of her best-known poems, among them *The Cry of the Children* and *Lady Geraldine's Courtship,* appeared in 1844. This last poem contained a compliment to Robert Browning, who called to thank her. Their acquaintance grew into a mutual love, and in 1846 they were married, greatly against the wishes of her father. It proved an unusually happy union. From the time of their marriage until Mrs. Browning's death, the poets lived in Italy, and here Mrs. Browning's health improved. She died in the Casa Guidi, as she had wished.

The *Prometheus Bound* (from the Greek of Aeschylus) and *Miscellaneous Poems* appeared in 1833; the *Seraphim and Other Poems* in 1838; *Casa Guidi Windows*, a poem on the struggles of the Italians for liberty in 1848–1849, was published in 1851, and the longest and most finished of all her works, *Aurora Leigh*, a narrative and didactic poem in nine books, was published six years later. Two posthumous volumes, *Last Poems* and *The Greek Christian Poets and the English Poets* (prose essays and translations), were edited by her husband. Her *Sonnets from the Portuguese*, written during her engagement to Browning and not shown even to him until after their marriage, bear comparison with the finest sonnets in the English language and perhaps surpass all other love sonnets. The title *From the Portuguese* was given them simply as a disguise.

Browning, OSCAR (1837–), an English writer and educational reformer, born in London and educated at Eton and at King's College, Cambridge. He was fifteen years master at Eton, after which he became lecturer on history and political science at Cambridge. Afterwards he was principal of the university training college for teachers. He is the author of *Modern England, Life of George Eliot, Life of Peter the Great, Wars of the Nineteenth Century* and *History of Educational Theories.* By the last work he is most widely known in the United States.

Browning, ROBERT (1812–1889), one of the great poets of the Victorian era. His life was uneventful, but in the main happy. His father and his mother were in sympathy with his aspirations, and his education was such as to call forth his highest powers. The fact, too, that he inherited perfect health from his father had much to do with the pure physical enjoyment of life which he expressed so often in his poems. His education was received neither in a large school nor in a college, but from private tutors and from travel on the Continent. He wrote poetry while he was but a boy, and when the poems of Shelley and Keats came into his hands they confirmed him in his desire to be a poet, although they made him look with disfavor on his own early attempts. His first published works met with little general success, although they were praised by the critics.

In 1844 Browning became acquainted with Elizabeth Barrett, through calling on her to thank her for a compliment which she had paid him in one of her poems. The acquaintance grew into love, and they were married in 1846. Their life together was very beautiful, and her death in 1861 was a shock from which Browning never completely recovered. He removed from Italy, where all of his married life had been spent, to England, that he might educate his son; there he was very popular socially. He returned, however, to Italy later, where he died. Browning was a most productive writer. From the time that his first poem, *Pauline*, appeared, in 1832, until his death he wrote rapidly, revising little. This unwillingness to revise, which amounted practically to an inability, prevented Browning from attaining the faultless form which distinguished Tennyson's works, but his poetry is by no means unmusical. Lines of great strength and beauty are frequent, and he attains at times a wonderful lyric lightness. One thinks, however, in reading Browning, less of the form than of the substance, and he is considered preëminent as a poet-thinker. The study of the human soul had for him the greatest fascination, and he was able to analyze it and to describe its experiences as perhaps no other English poet except Shakespeare has ever been able to do. His genius was distinctly dramatic, and had he lived in an age when the drama was the chief form of literary expression, he might have done his greatest work in that field. It is, however, in the dramatic monologue that he excelled. Such poems as *My Last Duchess, Andrea del Sarto, The Bishop Orders His Tomb at Saint Praxed's Church, Fra Lippo Lippi, A*

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Forgiveness, are fine examples of his success. *The Ring and the Book,* considered by most critics Browning's masterpiece, is a long poem made up of a series of monologues. The story is told simply in the first book, and in each of the remaining ones the view of some one speaker or class is expressed, and Browning is thus enabled to give some of his most subtle pictures of character.

Besides the poems mentioned above, his best-known works are the dramas *Strafford, A Blot on the 'Scutcheon, Colombe's Birthday, In a Balcony, Pippa Passes, Paracelsus; Saul, Rabbi Ben Ezra* and the poems comprised in the collection known as *Men and Women.*

Brown-Sequard, *sa kahr',* CHARLES EDOUARD (1818–1894), an American physician. His father was an American sea captain, his mother a French woman. He was a professor in the medical department of Harvard University, 1864–1868, and was connected with the Virginia Medical College. In 1869 he was appointed professor of pathology in the School of Medicine at Paris, in 1873 established a medical journal in New York and in 1878 became professor of medicine in the College of France. He wrote many scientific papers and contributed to the advance of his profession, but in his later years his reputation suffered from the advocacy of a certain remedy which proved to be worthless.

Brownsville, TEX., the county-seat of Cameron co., on the Rio Grande railroad and on the Rio Grande River, opposite Matamoras, Mexico. The city contains the Cathedral of the Immaculate Conception, a convent and an academy. Notable buildings are the county courthouse and the United States customhouse. It is the center of a stock-raising district and has an extensive trade with Mexico. Brownsville was settled in 1848 and was incorporated in 1853. It was captured by Mexican raiders in 1859, and during the Civil War was taken from the Confederates by a Union army under General Banks. Population in 1910, 10,517.

Brown-Tail Moth, a European moth very destructive to orchard, forest and shade trees, was introduced into New England about 1890. The female deposits her eggs on the under side of a leaf during the first three weeks in July; they hatch 15 or 20 days later. The young larvae begin feeding on the outer coat of the leaf and when full-grown, spin a cocoon of grayish silk. The caterpillars pupate within their cocoons at the tips of twigs the latter part of June, and the moths emerge about the middle of July. The wings are pure white, the name brown-tail being given the moth on account of a bunch of brown hair at the tip of the abdomen of the female. The wing expanse of the female is about 1½ inches, the male being slightly smaller. The destructive work is done by the caterpillars, whose winter webs can be seen at the tips of twigs from October to April. Webs should be removed and burned. Spraying with kerosene emulsion or strong soap suds destroys the caterpillars. (See INSECTICIDES.) On mornings during the flying season hundreds of the moths can be seen collected on lamp poles. Web destruction is by far the best means of exterminating the moth. See GYPSY MOTH.

Brown Thrash'er, often incorrectly called a brown thrush, a large, handsome, reddish-brown bird, common in the eastern United States, where it is considered one of the finest native songsters, not much inferior to the mocking bird. It is a good mimic, and in the early morning or evening time it perches in the top of a tree and sings sometimes for an hour or more. It nests in shrubbery and brush piles.

Brown University, an educational institution in Providence, R. I., established in 1764 by an act of the general assembly of the state, under the name of Rhode Island College. The College was founded at the request of the Baptists, under whose auspices it has always continued, although it is non-sectarian. In 1804 the name was changed to Brown University, in honor of Mr. Nicholas Brown, who had bequeathed the institution a large sum of money. Its scope was enlarged during the middle of the nineteenth century, and from 1890 to the present time its number of students has greatly increased. In 1891 a woman's college was established, known as the Woman's College in Brown University. The institution has over 90 professors and instructors, about 1000 students and an endowment fund of $2,000,000.

Brownwood, TEX., the county-seat of Brown co., is situated 140 mi. s.w. of Fort Worth, on the Fort Worth & Rio Grande and the Gulf, Colorado & Santa Fé railroads. The city has a beautiful location, and has grown rapidly. The chief industries include cotton-jinning and milling. It is an important shipping point for cotton, wool, pecans and other products. Population in 1910, 6967.

Bruce, ROBERT (1274–1329), the greatest of the kings of Scotland. In 1296, as earl of Carrick, he swore fealty to Edward I, and in the following year he fought on the English side against Wallace. He then joined for a time the Scottish army, returned again to his allegiance to Edward, and in 1299 he was appointed one of the four regents of the kingdom. In the three final campaigns he managed to keep up friendly relations with Edward and resided for some time at his court. In 1306, in a violent quarrel with Comyn, a claimant to the Scottish throne, he stabbed his adversary. He then assembled his vassals and claimed the crown, which he received at Scone. After being twice defeated, he dismissed his troops, retired to the Irish coast and was supposed to be dead; but in the spring of 1307 he landed on the Carrick coast, defeated the earl of Pembroke at Loudon Hill and in two years had wrested nearly all of Scotland from the English. He then advanced into England, laying waste the country; and in 1314 he defeated at Bannockburn the English forces advancing under Edward II to the relief of the garrison at Stirling. In 1316 he went to Ireland to the aid of his brother Edward, and on his return in 1318, in retaliation for inroads made during his absence, took Berwick and harried Northumberland and Yorkshire. Hostilities continued until the defeat of Edward near Biland Abbey in 1323, and though in that year a truce was concluded for thirteen years it was speedily broken. Not until 1328 was the treaty concluded by which the independence of Scotland was fully recognized. Bruce did not long survive the completion of his work, but died at Cardross Castle in 1329. He was twice married, first, to a daughter of the earl of Mar, by whom he had a daughter, Marjory, mother of Robert II; and then to a daughter of the earl of Ulster, by whom he had a son, David, who succeeded him.

Bruges, *broozh*, an old walled city of Belgium, capital of West Flanders, 55 mi. n. w. of Brussels, on the railway to Ostend. It is an important canal center and has over fifty bridges, all opening in the middle for the passage of vessels. Among its more noteworthy buildings are the Halles, a fine old building, with a tower 354 feet high, in which is a fine set of chimes; the Hotel de Ville; the Bourse; the Palace of Justice, and the Church of Nôtre Dame, with its elevated spire and splendid tombs of Charles the Bold and Mary of Burgundy. The principal canals are those to Sluis, Ghent and Ostend, on all of which large vessels can come up to Bruges. In the thirteenth and fourteenth centuries the city was one of the chief commercial places in Europe and was an important member of the Hanseatic League. Toward the end of the fifteenth century it began to decline, but it still carries on a considerable trade with northern Europe and is, through its canals, a center of Belgian commerce. The manufactures include lace, textiles and tobacco, and there are shipbuilding yards and breweries. Population in 1901, 52,867.

Brum'mell, GEORGE BRYAN (1778–1840), an English man of fashion, best known as Beau Brummell. He was educated at Eton and at Oxford, and at the age of sixteen he made the acquaintance of the prince of Wales, afterward George IV, who made him a cornet in his own regiment of the Tenth Hussars and secured his rapid promotion. The death of his father brought him a fortune, which he expended in a course of sumptuous living, extending over twenty-one years, during which his opinions on matters of etiquette and dress were received as indisputable. His creditors at length became clamorous, and in 1816 he took refuge in Calais, where he resided for many years, supported partly by the remains of his own fortune and partly by remittances from friends in England. Subsequently he was appointed consul at Caen, but on the abolition of the post he was reduced to absolute poverty and died in a lunatic asylum at Caen.

Brunelleschi, *broo'nel les'ke,* FILIPPO (1377–1446), an Italian architect, born in Florence. When at Rome with Donatello he conceived the idea of bringing architecture back from the Gothic style to the principles of Greece and Rome. In this he was successful, as his work opened the way for Bramante and others, but he himself did not depart entirely from the medieval art, as was shown by his design for the façade of the Church of Santa Maria Novella. In 1417 he removed to Florence, where he lived the rest of his life. His great achievement was the dome of the Cathedral of Santa Maria at Florence, the possibility of erecting which was denied by other architects. It has remained, however, unsurpassed, for the dome of Saint Peter's, though excelling in height, is inferior to it in massiveness of effect. Among other important works by him were the Pitti Palace at Florence and the Pazzi Chapel at Santa Croce.

Brunhilde, *broon hil'da.* See NIBELUNGENLIED; SIGURD.

Brünn, *brün,* an Austrian city, capital of Moravia, on the railway from Vienna to Prague, nearly encircled by the rivers Schwarzawa and Zwittawa. It contains a cathedral and other handsome churches, a landhaus, where the provincial assembly meets, several palaces, a barracks and a new theater. Brünn has extensive manufactures of woolens, which have procured for it the name of the *Austrian Leeds*. There are other manufactures of leather, machinery, chemicals and beer. It is the center of Moravian commerce, a great part of which is carried on by fairs. Brünn dates back to the ninth century, though the new town was not founded until five hundred years later. Population in 1900, 108,944.

Brunswick, *brunz'wik,* a city of Germany, capital of the duchy of the same name, situated on the Oker River, 35 mi. s. e. of Hanover, and on the railway from Hanover to Berlin. The streets of the older part of the town are narrow and winding and have all the characteristics of the cities of the Middle Ages. The most important public buildings are the ducal palace; the Cathedral of Saint Blaise, erected in 1173; Saint Catherine's church, 1172, and Saint Magnus's church, 1031; the Gewandhaus, and the old Gothic Council House. The educational institutions include a polytechnic school, a gymnasium and the Collegium Carolinum, an institution in grade between the common school and the university. The city also has a city museum and a public library. The leading industries are manufactures of woolens, linen goods, jute, machinery and chemical products. The city owns its gas plant and waterworks, slaughter houses and markets; it also has an excellent sewage system. It is an important railway center and carries on a good trade in home products, grains and manufactures. Population in 1900, 128,177.

Brunswick, a duchy in the northwestern part of the German Empire. It is divided into several districts and is surrounded by the Prussian provinces of Hanover, Saxony and Westphalia. The northern portion is hilly, or undulating. The southeastern part contains a portion of the Harz mountain system and rises in some places to an altitude of more than 3000 feet. Deposits of iron ore, lead, copper and brown coal are found, and mining is an industry of some importance. About one-half of the land is capable of tillage, and the leading crops are grain, flax, hops, tobacco and fruit. The manufacturing industries include brewing, distilling and the manufacture of linens, woolens, leather, paper, also tobacco, soap and beet sugar. Brunswick is a state of the German Empire, sends two members to the Bundesrath and three deputies to the Reichstag. Its internal government is a constitutional monarchy. Population in 1900, 464,251.

Brunswick, Ga., a city in Glynn co., 91 miles s. of Savannah, on Saint Simons Sound, 8 miles from the Atlantic Ocean, and on the Southern and other railroads. The first settlement was made by James Oglethorpe in 1735, but the commercial importance of the place did not develop till after the Civil War. There is a spacious harbor, and the chief exports are cotton, phosphates, tar, turpentine and pine lumber. The city has excellent hotel accommodations, and many points of public interest make it a popular summer and winter resort. Population in 1910, 10,182.

Brunswick, Me., a town in Cumberland co., 26 mi. n. e. of Portland, on the Androscoggin River and on the Maine Central railroad. The falls in the river afford water power for the manufactures, which include cotton goods, flour, and brass, steel and wooden specialties. Bowdoin College and the Medical School of Maine are located here. The first settlement, called Pejepscot, was made in 1628 and was incorporated as Brunswick in 1717. Population in 1910, 6,621.

Brunswick, Family of, a distinguished family founded by Albert Azo II, marquis of Reggio and Modena, a descendant, by the female line, of Charlemagne. He married Cunigunda, heiress of the counts of Altorf, thus uniting the two houses of Este and Guelph. From his son, Guelph, who was created duke of Bavaria in 1071 and married Judith of Flanders, a descendant of Alfred of England, descended Henry the Lion, who succeeded in 1125 to the control of the duchy and by marriage acquired Brunswick and Saxony. Otho, the great-grandson of Henry, by a younger branch of his family, was the first who bore the title of duke of Brunswick (1235). By the two sons of Ernst the Confessor, who became duke in 1532, the family was divided into the two branches of Brunswick-Wolfenbüttel and Brunswick-Lüneburg (House of Hanover), from the latter of which comes the present royal family of Britain. The Brunswick-Wolfenbüttel was the family in possession of the duchy of Brunswick until the death of the last duke in 1884. George Louis, son of Ernst Augustus and Sophia, granddaughter of James I of England, succeeded his father as elector of Hanover in 1698 and was called to the throne of Great Britain in 1714 as George I.

Brunswick Black, a varnish composed chiefly of lampblack and turpentine, and applied to cast-iron goods to give them a glossy black and enamel-like surface. Asphalt and oil of turpentine are also ingredients in some varieties.

Brusa or **Broussa**, *broo'sah*, (in ancient times, Prusa), a Turkish city in Asia Minor, s. of the Sea of Marmora, about 20 mi. from its port, Mudania. The town is situated in a fertile plain, which is enclosed by the ridges of Olympus and abounds in hot springs, celebrated for their medicinal properties. Formerly Brusa contained many mosques, but earthquakes have so damaged them that their splendor has been lost, and they are in ruins to-day. The leading industries are the manufacture of carpets, gauze and silks of a very fine texture. The city is a very important commercial center of the Turks. Brusa represents the ancient Prusa, long capital of Bithynia, and one of the most flourishing towns in the Greek empire of Constantinople. It was the residence of the Turkish sovereigns from 1329 until the transference of the seat of empire to Adrianople in 1365. Population, estimated at about 90,000.

Brush, an implement made of bristles, fibers or wire, set in a back and used for smoothing, cleaning and other purposes. Brushes are of two classes, those having stiff fiber and those with flexible fiber. The stiff brushes are made of hogs' bristles, whalebone, palm fibers and occasionally of wire. The flexible brushes are made of fine bristles and the hair from certain animals, such as the camel, badger, squirrel, sable and goat. These are chiefly used for painting, and the smallest kind are called *pencils*. Brushes having more than one tuft of fiber are made by fastening the tufts into holes in the back, by means of a wire. When the tufts have all been fastened, a piece of finished wood or other substance is glued upon the back, and then the tufts are cut the same length.

Brush, CHARLES FRANCIS (1849–), an American inventor, born in Euclid, Ohio, and educated at the University of Michigan. He became an analytical chemist and turned his attention to electric lighting. He is especially known as the inventor of the Brush dynamo for arc lighting, and of an electric lamp, as well as of a large number of devices which have been of great use in the development of the electric light. See ELECTRIC LIGHT.

Brush Turkey. See MOUND BIRD.

Brus'sels, the capital of Belgium and of the province of Brabant. The city consists of a lower town and an upper town. The older or lower part is surrounded with fine boulevards, on the site of its fortifications, and is devoted almost entirely to commerce and industry. The upper town, which is partly inside the boulevards and partly outside, is the finest part of the city and contains the king's palace, the government offices and the finest streets and hotels. Among the important buildings are the Hôtel de Ville, a part of which dates from the fifteenth century, an imposing Gothic structure, with a spire 364 feet in height, the square in front of it being perhaps the most beautiful of all the public places of Brussels; the Cathedral of Saint Gudule, begun about 1220, the finest of many fine churches, richly adorned with sculptures and paintings; the royal palace; the Palace of the Nation, and the Palace of Justice. The institutions comprise a university, an academy of science and the fine arts and polytechnic school; one of the finest observatories in Europe; a conservatory of music; a public library containing 400,000 volumes; a picture gallery, with the finest specimens of Flemish art, and many learned societies and educational organizations. The manufactures and trade are greatly promoted by canal communications with Charleroi, Mechlin, Antwerp and the ocean, and by the network of Belgian railways. The industries are varied and important. Lace, an ancient manufacture, is still of great importance, and the manufacture of cotton and woolen fabrics, paper, carriages and many minor products is carried on. There are breweries, distilleries, sugar refineries and foundries. During the Middle Ages Brussels did not attain great importance. It was fortified with walls by Baldric of Louvain in 1044, and in 1430, when Brabant passed into the hands of the dukes of Burgundy, was a prosperous city. It became the seat of government during the rule of the Hapsburgs, early in the sixteenth century. It was bombarded and burned by the French in 1695, was again taken by the French in 1794 and was retained till 1814, when it became the chief town of the Department of the Dyle. From 1815 to 1830 it was one of the capitals of the Kingdom of the Netherlands, and in 1830 it was the chief center of the revolt which separated Belgium from Holland, becoming in that year the capital of Belgium. Population in 1901, 211,429.

Brussels Sprouts, one of the cultivated varieties of cabbage, having an elongated stem four or five feet high, with small clustering green heads like miniature cabbages.

Bru'tus, the first king of Britain, a purely mythical personage, said to have been the son of Sylvius and the grandson of Ascanius, the son of Æneas. He landed in Devonshire, destroyed the giants then inhabiting Albion and called the island from his own name. At his death the island was divided among his sons, Locrine, Cumber and Albanact.

Brutus, Decimus Junius (84–43 b. c.), a Roman soldier who served under Julius Caesar in Gaul, was afterward commander of his fleet and was even chosen as Caesar's heir in the event of the death of Octavius. Despite this, however, he joined in the assassination of Caesar. He was afterward for a short time successful in opposing Antony, but he was deserted by his soldiers in Gaul and betrayed into the hands of his opponent, who put him to death.

Brutus, Lucius Junius, an ancient Roman hero, son of Torquinia, and nephew of Tarquin the Proud. He saved himself from the persecutions of Tarquin the Proud by pretending to be insane, whence his name Brutus (stupid). On the suicide of Lucretia, however, he threw off the mask and headed the revolt against the Tarquins (See Lucretia). Having secured their banishment, he proposed to abolish the regal dignity and introduce a free government, with the result that he was elected to the consulship, in which capacity he condemned his own sons to death for conspiring to restore the monarchy. He fell in a battle with the Tarquins about 509 b. c. Much of the story of Brutus is legendary.

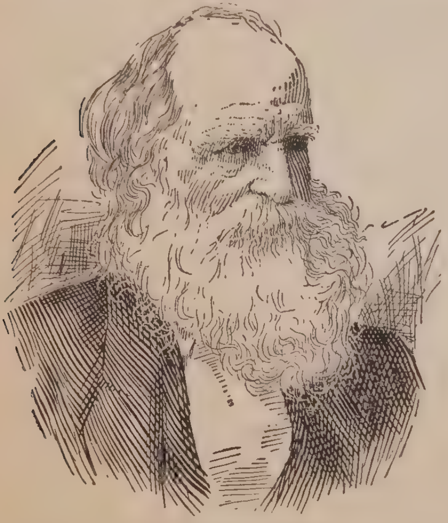
Brutus, Marcus Junius (85–42 b. c.), a distinguished Roman. He was at first an enemy of Pompey, but joined him on the outbreak of civil war and remained with him until the Battle of Pharsalia. He then surrendered to Caesar, who made him in the following year governor of Cisalpine Gaul, and afterward of Macedonia. He soon, however, joined the conspiracy against Caesar, and by his influence insured its success (See Caesar, Caius Julius). After the assassination he took refuge in the East, made himself master of Greece and Macedonia and with a powerful army joined Cassius in the subjugation of the Lycians and Rhodians. In the meantime the triumvirs, Octavianus, Antony and Lepidus, had been successful at Rome, and were prepared to encounter the army of the conspirators, which, crossing the Hellespont, assempled at Philippi in Macedonia. Cassius appears to have been beaten at once by Antony; and Brutus, though temporarily successful against Octavianus, was totally defeated twenty days later. He escaped with a few friends; but, seeing that his cause was hopelessly ruined, he fell upon the sword held for him by his friend Strabo, and died.

Bryan, William Jennings (1860–), a distinguished American lawyer, editor and statesman, born at Salem, Ill. He attended the public schools in his native village and completed his education at Whipple Academy and at Illinois College, Jacksonville, Ill. He then entered the Union College of Law at Chicago, graduating in 1883, and began the practice of his profession at Jacksonville. In the following year he was married to Miss Mary Baird, who, having also received a legal education, was thereafter his adviser in both business and politics. In 1887 he removed to Lincoln, Neb., where he continued to practice law and also entered politics, affiliating with the Democratic party. He soon attracted public notice by his eloquent advocacy of free trade. By a vigorous personal canvas he was chosen to Congress from a Republican district by a huge majority and for two terms was a conspicuous member of that body. During this service he heightened his reputation as a political orator by several notable speeches in favor of free trade. In 1893 he was Democratic candidate for the United States Senate, but was defeated. Soon afterward he became editor of the *Omaha World-Herald*, but after a short time returned to the practice of law.

During his terms in Congress he had severely criticised the Cleveland administration for its attitude upon the money question, and at the Democratic national convention in Chicago in 1896, by a remarkable speech urging the adoption of the policy of free coinage of silver at the ratio of sixteen to one, he captured the nomination for the presidency. His candidacy was endorsed by the Populist and Silver Republican parties. Then followed one of the most noteworthy campaigns in American history, during which Bryan traveled more than 18,000 miles and made hundreds of addresses. He was defeated, however, by William McKinley, the Republican candidate. At the outbreak of the Spanish-American War, he organized a volunteer regiment and became its colonel. In 1900 Bryan was again nominated for president by the Democrats, Populists and Silver Republicans, on a platform which declared "imperialism" to be the paramount issue of the campaign. He again made an active canvass, but was defeated by an increased majority. He then founded a weekly paper at Lincoln, Neb., called the *Com-*

moner. He was nominated the third time for the presidency at the Democratic convention held at Denver in 1908. He is the author of *The First Battle*, an account of the campaign of 1896.

Bry'ant, William Cullen (1794–1878), an American poet and journalist, born at Cummington, Mass., November 3, 1794. His father was a physician and hoped that his son would follow the same profession; but young Bryant early showed that he was destined for a literary career. When but ten he contributed his first poem to a country newspaper, and at fourteen he published *The Embargo* in Boston. Bryant entered Williams College in 1810. but at the end of a year he left to study law. In 1814 he removed to Bridgewater, Mass., to continue his studies, was admitted to the bar in 1815 and practiced his profession for ten years.


WILLIAM CULLEN BRYANT

It was probably in his seventeenth year that Bryant wrote *Thanatopsis*, which in 1817 was published in the *North American Review*. When Bryant left Cummington to enter the law school he left the poem among other papers at home, where it was accidentally discovered by his father, who took it to Boston and showed it to several men prominent in literature. Their high commendation led to its publication in the *Review*. Before he was twenty-one Bryant had written *Thanatopsis*, *To a Yellow Violet*, *Inscription for the Entrance to a Wood*, *To a Waterfowl* and some other poems of less merit. He became a frequent contributor to the *North American Review*, most of his articles consisting of literary criticism. In 1821 he was invited to deliver a poem before the Phi Beta Kappa society of Harvard, and for the occasion he wrote *The Ages*, which, with several other poems, was published in 1825. In this same year he removed to New York and became associate editor of the *New York Evening Post*, of which, three years later, he became editor in chief. He retained this position until his death, which occurred from sunstroke June 12, 1878.

Bryant's place in American literature is unique; his career as author and journalist covered two-thirds of a century; he was the "Father of American Poets" and the model American writer of verse until the rise of Longfellow. During the long period of his active life he retained to their fullest capacity his superb intellectual powers. He never ceased to be progressive and productive. Stoddard says of him: "He enjoyed the dangerous distinction of proving himself a great poet at an early age; he preserved this distinction to the last, for the sixty-four years which elapsed between the writing of *Thanatopsis* and the *Flood of Years* witnessed no decay in his poetic capacities, but rather the growth and development of trains of thought and forms of verse of which there was no evidence in his early writings." Bryant was the poet of nature, but few of his poems are without the note of moralizing. Nearly all are short, and many of them are so well known as to be almost household words. Besides those already mentioned, may be cited *To the Fringed Gentian*, *The Death of the Flowers*, *The Crowded Street*, *My Country's Call* and *The Battlefield*, as among his popular poems. He also translated the *Iliad* and the *Odyssey* and published *Letters of a Traveler*; *Letters from the East*; *Letters from Spain and Other Countries*, and *Orations and Addresses*.

While Bryant will always be remembered as a poet, he attained as an editor a distinction won by few. For fifty years he was associated with, and during most of the period was proprietor of, one of the leading journals of the country. His editorials were plain, direct, straightforward and convincing. An uncompromising abolitionist, he dealt telling blows against slavery through his editorials. His long services as a writer on public affairs were influential, and he lived to see many of the reforms which he advocated become firmly established.

Bryce, *brise*, James (1838–), a British historian and politician, born at Belfast and educated at the University of Glasgow and at Oxford. He studied law and was admitted to the bar in 1867. Three years later he was made regius professor of civil law of Oxford, and this position he held for twenty-three years. While serving as a member of Parliament he gave a great impetus to the cause of national education in England, and this secured for him the chairmanship of the Royal Commission on Secondary Education in 1894. In 1892 he was a member of Gladstone's cabinet. He was from the first a Liberal in politics and a strong advocate of Home Rule for Ireland, and became chief secretary for Ireland. In 1905 Mr. Bryce was again appointed Ambassador to the United States. Bryce's most important literary work is his history of *The Holy Roman Empire*, and next to that is the *American Commonwealth.*

Bryn Mawr, *mar,* **College,** an institution for the higher education of women, located at Bryn Mawr, Pa., and founded in 1880 by Joseph W. Taylor, who was a member of the Society of Friends. The college is characterized by its high requirements for admission and the general culture and high scholarship of its students. It maintains a faculty of forty-six members and has over 440 students.

Bryophytes, *bri′o fites,* members of one of the four orders into which the non-flowering plants are divided. The two great classes of bryophytes are the liverworts and mosses. None of the plants have true roots, but develop other organs which perform the same work. Some have leaves, but others are leafless. See MOSSES.

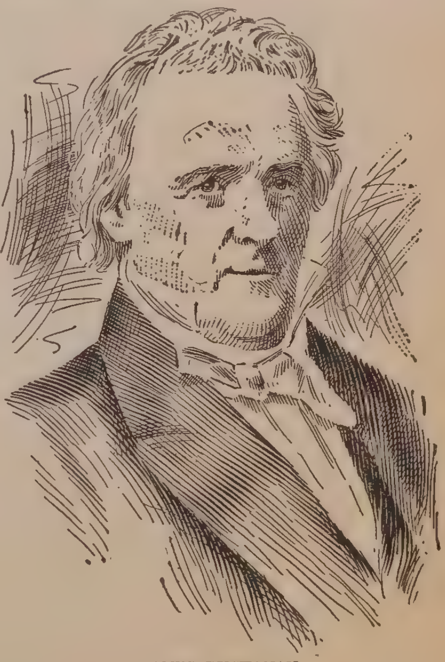
Bubas′tis or **Bubas′tus,** the name given by the Greeks to an ancient Egyptian city, the home of the rulers of the twenty-second and twenty-third dynasties. The city was built in honor of the goddess Bubastis, and the ruins of several fine temples to her have been found. Outside of the city, cats, which were sacred to the goddess, were buried in great numbers.

Bubon′ic Plague. See PLAGUE.

Buc′caneers′, the name given to a class of adventurers who in the sixteenth and seventeenth centuries infested the Caribbean Sea and neighboring coasts and preyed upon commerce. The first were the Elizabethan seamen, including Drake and Hawkins, who operated against Spain with the consent and assistance of the British government, on account of the religious wars between the two countries. In the eighteenth century, as the codes of international law became more settled and embodied more advanced ideas, buccaneers or freebooters were compelled to adopt the methods of pirates, among whom Captain Kidd was perhaps the most famous. The next step was to the practice of marooning, that is, putting those whom they had robbed ashore on desert islands. By the end of the eighteenth century, all of these practices had practically been abandoned.

Bucentaur, *bu sen′tawr,* a mythical monster, half man and half ox. The name Bucentaur was also given to the splendid galley in which the doge of Venice annually wedded the Adriatic.

Bucephalus, *bu sef′a lus,* the favorite horse of Alexander the Great, which, according to legend, Alexander himself broke in. The horse died during Alexander's expedition to India, and Alexander built over its grave a city called Bucephalia.



JAMES BUCHANAN

Buchanan, *bu kan′an,* JAMES (1791–1868), fifteenth president of the United States, born at Stony Batter, Pa., and educated at Dickinson College. He studied law, was admitted to the bar in 1812 and soon obtained a large practice. He then entered the army and served as a private during the War of 1812, was elected to the Pennsylvania legislature in 1814, and to Congress in 1821, where he remained ten years. In 1831 Buchanan retired from Congress, and he was soon afterwards appointed United States minister to Russia, but was elected to the Senate in 1833. There he vigorously defended the president's right to remove officials without the consent of the Senate.

During Van Buren's administration he gave his support to the establishment of an independent treasury; under Tyler he sustained the veto power, opposed the ratification of the Webster-Ashburton Treaty and was one of the earliest advocates of the annexation of Texas. In 1845 he left the Senate and became secretary of state in Polk's cabinet. While occupying this position he was largely instrumental in settling the northwestern boundary between the United States and British provinces. On the election of Pierce, Buchanan was appointed minister to Great Britain. He was a pro-slavery man and signed the Ostend Manifesto (See OSTEND MANIFESTO). In 1856 he secured the Democartic nomination for the presidency, and at the election he received 174 electoral votes, being elected over Fremont, the Republican, and Fillmore, the Know-Nothing.

During Buchanan's administration the controversy over slavery reached its crisis. Among the important events of his administration were the negotiation of a commercial treaty with China and the securing from England of an acknowledgment of the rights of neutral ships.

While Buchanan did not favor secession, he held that the United States had no authority to prevent it and did not take steps to oppose the confiscation of government property in the South. Though he refused to withdraw the United States troops from South Carolina, he also refused to send them reënforcements. On retiring from office Mr. Buchanan went to his home in Lancaster, Pa., where he died. In 1866 he published *Mr. Buchanan's Administration on the Eve of the Rebellion.*

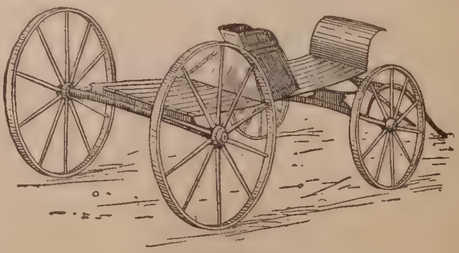
Buchanan, ROBERT WILLIAM (1841–1901), an English poet and author, educated at the University of Glasgow. He was for many years a writer for the *Contemporary Review*, published several novels and some good poetry, and wrote the plays of *A Man's Shadow* and *Dick Sheridan.* His criticisms, under the title of *The Fleshly School of Poetry* and *The Voice of the Hooligan*, on Rossetti and Kipling, respectively, stirred up much discussion.

Bucharest or **Bukharest,** *boo'ka rest'*, the capital of Rumania, situated on the Dimbovitza River, about 33 mi. n. of the Danube, in a fertile plain. It is, in general, poorly built. Among the chief buildings are the royal palace, the national theater, the university buildings, the national bank, the mint and the archiepiscopal church. There are also handsome public gardens. The manufactures are varied, but unimportant; the trade is considerable, the chief articles being grain, wool, honey, wax, wine and hides. The mercantile portion of the community is mostly foreign, and the whole population presents a curious blending of nationalities. The city became the capital of Wallachia in 1665; in 1862 it was made the capital of the united principalities of Wallachia and Moldavia. A treaty was concluded here in 1812 between Turkey and Russia, by which the latter obtained Bessarabia and part of Moldavia. Population, 282,070.

Buck, DUDLEY (1839–1909), an American musical composer, born at Hartford, Conn. He studied in Leipzig, Dresden and Paris, settled in Chicago for several years, then became organist of Boston Music Hall and afterward of Trinity Church, Boston. He wrote a cantata, which was performed under the direction of Theodore Thomas at the inauguration of the Centennial Exhibition of 1876, and he also composed several popular operettas and many compositions for the organ.

Buck Bean, Bog Bean or **Marsh Trefoil,** a beautiful plant, common in spongy, boggy soils, and found in Britain, throughout Europe, in Siberia and in North America. It is from six to twelve inches in height, and it flowers in early summer. The beautiful clustered flowers are waxy white and are covered on the inner surface with a coating of dense fleshy hairs. The whole plant, the root especially, has an intensely bitter taste and formerly ranked as a tonic

Buck'board, a four-wheeled carriage, having a plank attached to the hind axle and to a crossbar in front. The crossbar is attached to the front axle by a kingbolt. The buckboard may contain one or more seats. The vehicle obtains its name from the fact that it was originally constructed so as to buck against, or withstand, the rough usage of the poor roads in the New England and Middle States.


BUCKBOARD

Buck'eye, an American name for certain species of horse-chestnuts. Ohio is called the Buckeye State. See HORSE-CHESTNUT.

Buck'ingham, GEORGE VILLIERS, Duke of (1592–1628), a favorite of James I and Charles I of England. In 1623, when the earl of Bristol was negotiating a marriage for Prince Charles with the infanta of Spain, Buckingham went with the prince to Madrid to carry on the suit in person. The result, however, was the breaking off of the marriage and the declaration of war with Spain. After the death of James, Buckingham was sent to France, as proxy for Charles I, to marry Henrietta Maria.

In 1626, after the failure of the Cadiz expedition, he was impeached, but was saved by the favor of the king. Despite the difficulty in obtaining supplies, Buckingham took upon himself the conduct of a war with France, but his expedition in aid of Rochelle proved an entire failure. In the meantime the spirit of revolt was becoming more formidable; the Petition of Right was carried despite the duke's exertions, and he was again protected from impeachment only by the king's prorogation of Parliament (See PETITION OF RIGHT). He then set out on another expedition to Rochelle, but was assassinated while embarking.

Buckingham, WILLIAM ALFRED (1804–1875), an American politician, noted as the "war governor" of Connecticut. He was born in Lebanon, Conn., and in 1825 began a business career in Norwich, where he amassed a considerable fortune. He was active in politics, being several times elected mayor of Norwich, and from 1858 to 1866 was governor of Connecticut. Largely through his influence the state contributed to the Union armies more than one-half of its able-bodied men between the ages of eighteen and forty-five years. In 1869 Buckingham was elected to the Senate, where he remained until his death. During the last years of his life he was active in the cause of temperance and was a conspicuous member of the Congregational Church.

Buckingham Palace, a royal palace in London, facing Saint James's Park, built in the reign of George IV, and forming one of the residences of the British sovereign.

Buck'land, FRANCIS TREVELYAN (1826–1880), an English naturalist. After continued study of medicine he became house surgeon at Saint George's Hospital and later was assistant surgeon in the Second Life Guards. On the establishment of the *Field,* he joined the staff and was a constant contributor. In 1866 he commenced a weekly journal of his own, *Land and Water.* His interest in fish culture led him to establish at his own cost a museum at South Kensington, which developed into the International Fisheries Exhibition in 1883. His best known books are his *Curiosities of Natural History, The Logbook of a Fisherman and Zoologist* and the *Natural History of the British Fishes.*

Buck'le, HENRY THOMAS (1821–1862), an English historical writer. At the age of eighteen he gave up his position in his father's counting-house and devoted himself entirely to study. His chief work, a philosophic *History of Civilization,* of which only two volumes were completed, was characterized by much novel and suggestive thought and by the use of a vast store of materials drawn from the most varied sources. He died at Damascus.

Buck'ner, SIMON BOLIVAR (1823–), an American soldier and politician, born in Kentucky. He was educated at West Point and served with distinction in the Mexican War. At the outbreak of the Civil War he joined the Confederate army and performed good service throughout the war, especially in the defense of Fort Donelson, at Murfreesboro and at Chickamauga. On May 26, 1865, he surrendered the last army corps of the Confederates to General Canby, of the Federal army. In 1896 he was a candidate for the vice-presidency on the National (Gold) Democratic ticket, with Senator Palmer of Illinois.

Buck'tails, a name at first given to the Tammany Society of New York City, from the fact that the members for a time wore bucks' tails as badges. The organization opposed Clinton's canal policy, and from this fact the name *bucktail* was finally applied to any one who disapproved of that policy. Under the leadership of Martin Van Buren, the faction gained control of the Democratic state organization.

Buck'thorn, the name of a large genus of trees and shrubs, several species of which belong to North America. The common buckthorn, a British and North American shrub, grows to seven or eight feet in height, has strong spines on its branches, elliptical and serrated leaves, male and female flowers on different plants, a greenish-yellow calyx, no corolla and a round, black berry. It flowers in May. One species in the Pacific states yields the cascara bark which is used medicinally.

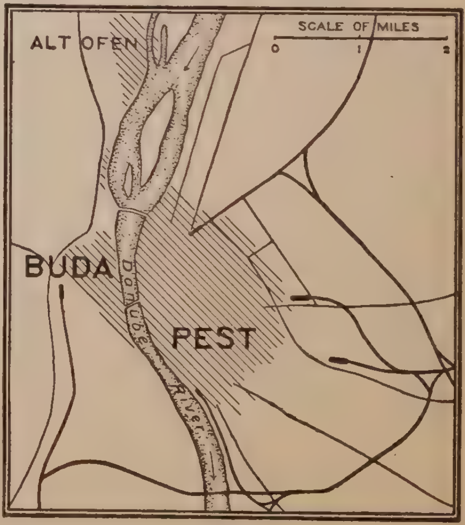
Buck'wheat, a plant producing a three-sided seed and usually styled a grain, though really very different from the grains and belonging to the same family as the pieplant. The origin of buckwheat is not known, but it is supposed to be a native of Asia and was therefore named *Saracen wheat* by the French. The plant has smooth, branching stems, green leaves with dark veins, and white flowers. It takes its name from a German word meaning *beech wheat,* because of the resemblance of the seeds to the beechnut. Buckwheat grows in poor soil and is extensively cultivated in China and other Eastern countries as a food plant. In Europe the seed is used principally as feed for stock and poultry, but in the United States it is quite extensively used to make flour from which delicious cakes are prepared. Buckwheat is quite generally grown in the United States east of the Mississippi River and from Pennsylvania northward. Compared with other crops, however, the amount produced is small.

BUCKWHEAT

Bucyrus, *bu si'rus,* OHIO, the county-seat of Crawford co., 61 mi. n. of Columbus, on the Sandusky River and on the Pennsylvania and other railroads. The neighboring country is engaged in agriculture and stock-raising, and the city has important manufactures. The products include machinery, heating apparatus, furniture and wagons. There is a park in the city, and there are numerous mineral springs in the surrounding region. Bucyrus was settled in 1818 and was incorporated in 1829. Population in 1910, 8122.

Bud. A bud is an undeveloped stem, leaf or flower and is a provision for carrying living parts safely through winter or an unfavorable season. By opening a large leaf-bud, such as one may find on a hickory tree, it is possible to see the regular transition from the perfect leaves within, to the very simple, hairy scales that act as protective organs on the outside. The leaflets are packed away in perfect and regular order, always the same in any one kind of plants. For instance, the two halves of the cherry leaf are folded together with the under surfaces outward; in the common wood sorrel, each leaflet is folded smoothly, and then the three are packed away closely side by side. Special means of protection for the delicate inner parts are provided by nature in the way of waterproof varnish, warm woolly coats and thick, strong husks.

Budapest, *boo'da pest,* capital of the kingdom of Hungary, made up of Buda on the right bank of the Danube, and Pest on the left bank, the two connected by several fine bridges. Buda, the smaller and more ancient of the two, is situated on and about a hill, which is crowned with a citadel and the royal palace. The city is noted for its bitter-water springs, such as the Hunyadi Janos and others. Pest, on the east bank of the river, lies in a sandy plain and has an extensive frontage on the Danube. It has many beautiful buildings, among which are the new houses of Parliament, an academy of science, a national picture gallery, a national museum, a university and the royal opera house. The city is well endowed with educational and scientific institutions. Budapest is known also for its beautiful streets, the finest of which is Andrassy Strasse, probably one of the finest streets in Europe. In commerce and industry, Budapest ranks next to Vienna in the Empire. Its chief



manufactures are machinery, cutlery, glass, metal and leather articles, cement and liquors. The production of flour and bran is very extensive, and the milling industry an important one. The history of Buda dates back to about 150 A. D., when the city was the site of a Roman camp. In the sixteenth and seventeenth centuries it belonged to the Turks and it stood many sieges in this time. In 1848, under the Hapsburgs, it was taken by the Hungarians, after a heroic defense by Hentzi. Pest is of later origin, having been first a town inhabited by Germans in the thirteenth century. In the middle of the nineteenth century it became the capital of the Hungarian kingdom, and in 1873 it was united with Buda as Budapest, since which time its growth has been exceedingly rapid. Population of Budapest in 1900, 713,383.

BUDDHA

Buddha, *bood'ah,* (the Wise or the Enlightened), the sacred name of the founder of Buddhism, an Indian sage who appears to have lived in the sixth century B. C. His personal name was Siddhartha, and his family name Gautama; and he is often called Sakya-muni (from *Sakya,* the name of his tribe, and *muni,* a Sanskrit word meaning a sage). His father was king of Kapilavastu, a few days' journey north of Benares. Of the youth of Buddha little is known, except what comes through legends. These have been used by Edwin Arnold in his *Light of Asia.* Buddha's father, noticing his habit of religious dreaming and his desire for solitude, built for him a palace and surrounded him with every luxury that would induce him to remain at home. But fearing age, disease and death, the son left his father's court and studied with the Brahmans. He then went into solitude under a bo-tree and resolved to remain till he had gained a knowledge of the past, the present and the origin of evil. After a long period of meditation, fasting and self-torture, he came to the conclusion that this life is one link in a chain of transmigration, and that only extinction of all desire will deliver from suffering. Commencing at Benares, he began to teach his new faith, in opposition to the prevailing Brahmanism. Among his earliest converts were the monarchs of Magadha and Kosala, in whose kingdoms he passed most of the latter portion of his life, respected, honored and protected. See BUDDHISM.

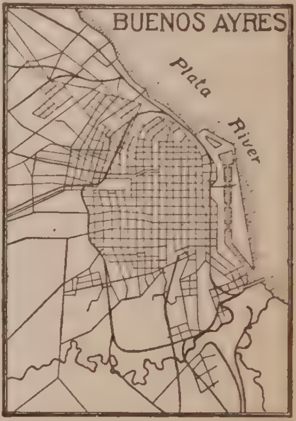
Buddhism, *bood'iz'm,* the religious system founded by Buddha, one of the most prominent doctrines of which is that *Nirvana,* or an absolute release from existence, is the chief good. According to Buddhism pain is inseparable from existence, and consequently pain can cease only through Nirvana; and in order to attain Nirvana our desires and passions must be suppressed, the most extreme self-renunciation practiced, and we must, as far as possible, forget our own personality. In order to attain Nirvana eight conditions must be kept or practiced: right view, right judgment, right language, right purpose, right profession, right application, right memory and right meditation. The five fundamental precepts of the Buddhist moral code are not to kill, not to steal, not to commit adultery, not to lie and not to give way to drunkenness, to which are added five others of less importance, binding more particularly on the religious class, such as to abstain from repasts taken out of season and from theatrical representations. There are six fundamental virtues to be practiced by all men alike, namely, charity, purity, patience, courage, contemplation and knowledge. These are said to "conduct a man to the other shore." The devotee who strictly practices these virtues has not yet attained Nirvana, but is on the road to it. The Buddhist virtue of charity is universal in its application, extending to all creatures and demanding sometimes the greatest self-denial and sacrifice. There is a legend that the Buddha, in one of his stages of existence (for he had passed through innumerable transmigrations before becoming "the enlightened"), gave himself up to be devoured by a famishing lioness, which was unable to suckle her young ones. There are other virtues, less important, indeed, than the six cardinal ones, but still binding on believers; lying is forbidden; evil-speaking, coarseness of language and even vain and frivolous talk, must be avoided. The essential theories of Buddhism are the theory of transmigration (borrowed from Brahmanism), which requires no explanation, but is so complete that a worm may become a supreme Buddha; the theory of the mutual connection of causes, and the theory of Nirvana. Sakya-muni, or Buddha, did not leave his doctrines in writing; he declared them orally, and they were carefully treasured up by his disciples and written down after his death. The canon of the Buddhist scriptures, as we now possess it, was the work of three successive councils and was finished at least two centuries before Christ. Buddhism was pure, moral and humane in its origin, but it came subsequently to be mixed up with idolatrous worship of its founder and other deities. In many things it ranks next to the Christian religion, but it is selfish, in that all these acts of wisdom are for the individual himself, in order that he may gain annihilation. Although now long banished from Hindustan by the persecutions of the Brahmans, Buddhism prevails in Ceylon, Burmah, Siam, Anam, Tibet, Mongolia, China, Java and Japan, and its adherents are said to number 147,900,000.

Bud'ding. See Grafting.

Bu'ell, Don Carlos (1818–1898), an American soldier, born near Marietta, Ohio. He graduated at West Point in 1841, served against the Seminoles in Florida, and in the Mexican War won the brevet of captain at Monterey, and that of major at Churubusco, where he was wounded. In 1861 he was appointed brigadier general of volunteers, and after organzing troops in Washington he was appointed to succeed Sherman in the Department of the Cumberland. By the aid of his division, which arrived at Shiloh toward evening of the first day's fighting, the Confederates, under General Beauregard, were driven to Corinth. On June 12, 1862, he assumed command of the Army of the Ohio, and later in the year he defeated Bragg at Perryville. A military commission was appointed to examine into his campaign in Kentucky and Tennessee, and as its report was unfavorable, Buell resigned from the service. Most military critics consider that he was an able officer.

Buena Vista, *bwa'na vees'ta,* Battle of, an important battle of the Mexican War, between an American force of 5000, under General Zachary Taylor, and a Mexican army of 17,000, under Santa Anna. It was fought on February 22 and 23, 1847. The Mexicans were the first aggressors, making several unsuccessful attempts to dislodge Taylor from a strong position on Angostura Heights. One of these attempts was all but successful, only the poor generalship of Santa Anna saving the Americans from defeat. On the second day the Mexicans were driven from the field. The losses of the Americans were about 750; of the Mexicans, fully 2000. The battle was the last important engagement of the northern campaign. See Mexican War.

Buenos Ayres, *bwa'nose i'rais,* (good air), the capital of Argentine Republic, situated on the La Plata River, 175 mi. from its mouth. The city is well laid out, has numerous boulevards and a park. The Plaza de la Victoria, 1200 feet long and 640 feet wide, occupies a prominent position in the central part of the city and is surrounded by public buildings, among which are the hall of Congress, the government palace, the municipal building and the departmental palace, the Hotel Argentine, the Episcopal palace and the cathedral. There are, besides these buildings, a number of Roman Catholic and Protestant churches and about twenty theaters. The educational institutions include the national university, considered the finest in South America, a normal school and numerous public and private schools. Buenos Ayres is the leading manufacturing town of South America, and its industries give employment to over one hundred thousand men. Among the manufactures are machinery, carriages, leather, boots and shoes, textiles, hides, tobacco and spirits. The city is also the leading commercial port of the country and of the continent, its annual trade exceeding $150,000,000. Population in 1909, estimated at 1,203,000.



Buffalo, a name given to several species of wild cattle, the best known of which is the common or Indian buffalo, larger than the ox and with stouter limbs, originally from India, but now found in most of the warmer countries of Asia. The buffalo is less docile than the common ox and is fond of marshy places and rivers.

The female gives much more milk than the cow, and from the milk the *ghee*, or clarified butter, of India is made. The hide is exceedingly tough, and a valuable leather is prepared from it, but the flesh is not very highly esteemed. Another Indian species is the *arnee*, the largest of the ox family. The *Cape Buffalo* is distinguished by the size of its horns, which are united at their bases, forming a great bony mass on the front of the head. It attains a greater size than an ordinary ox. The name is also applied to wild oxen in general, and particularly to the bison of North America. See BISON.

CAPE BUFFALO

Buf'falo, N. Y., the county-seat of Erie co., and the second city of the state, situated at the eastern end of Lake Erie, 540 mi. e. of Chicago and 410 mi. n. w. of New York, on the New York Central, the Lake Shore & Michigan Southern, the Grand Trunk, the Michigan Central, the Wabash, the Lackawanna, the Pennsylvania, the Lehigh Valley and numerous other railroads, and at the western end of the Erie Canal. The city is built upon a slight elevation from the lake, which affords an excellent view of the Niagara River and the Canadian shore. The streets are broad and regular and contain many large shade trees. Main Street, the principal business thoroughfare, runs north from the lake front. This, Niagara and other streets meet near Lafayette Square, which is the principal business center and is surrounded by large office buildings. The most important parks are Front Park, along the lake shore, Humboldt Park, in the eastern part of the city, and Delaware Park, adjoining the grounds of the state hospital for the insane. These and other parks are connected by a boulevard system. The city has one of the best systems of electric railways in the country, power being furnished by the dynamos at Niagara. A belt line of railway also encircles the city. Among the public buildings are the government building, which cost $2,000,000, the city and county hall, the Masonic Temple, the state hospital for the insane, the Ellicott Square building, one of the largest office buildings in the world, and a large number of churches. The elevated portions of the city are also notable for the many fine residences which they contain.

Buffalo is one of the most important lake ports and is an extensive trade and manufacturing center. Its location at the foot of Lake Erie and at the terminus of the Erie Canal early made it an important transfer point in the traffic between the East and the West. The city has over seven miles of wharfage, which extends along the Niagara River, and its harbor is protected by a government breakwater over a mile and a quarter in length. Every advantage is furnished for the storage and transshipment of grain and other commercial products. The grain elevators have a capacity of 30,000,000 bushels and facilities for handling over 5,000,000 bushels per day. Buffalo is the second city in the country in its live stock trade, and it also has a large trade in coal. As an iron manufacturing center it ranks next to Pittsburg. There are also large oil refineries, distilleries and breweries, and manufactures of leather, starch, soap, clothing and other materials, besides extensive meat-packing establishments.

The educational and philanthropic institutions include the orphan asylum, the state asylum for the insane, Saint John's Orphan Home, Saint Mary's Institution for Deaf Mutes, Saint Vincent's and Saint Joseph's orphanages and the Buffalo general hospital. One of the state normal schools is located here, as are the University of Buffalo, Saint Joseph's and Canisius's colleges and Martin Luther Seminary. The city contains two public libraries, which, combined, have over 225,000 volumes, besides libraries belonging to the Historical Society, the Society of Natural Sciences, the Y. M. C. A. and other organizations.

The site of the city was first visited by La Salle in 1679. In 1792 the first white settler appeared, and the locality became a center for fur traders. Between 1798 and 1803 the township was laid out. The growth of the settlement was slow, and in 1813 it was completely destroyed by the British. Two years later the town was rebuilt, and from that time on its growth has been steady, but between 1890 and 1900 the city increased in population more rapidly than during any preceding decade. In 1901 the Pan-American Exposition was held at Buffalo. Population in 1910, 423,715.

Buffalo Ber'ry, a small shrub, a native of the United States and Canada, with narrow, silvery leaves and close clusters of bright red acid berries, about the size of currants, which are made into preserves and used in various ways.

Buffalo Bill. See CODY, WILLIAM FREDERICK.

Buffalo Bur, a weed, native of America, common in the western and in the eastern states and in Germany and England. It is allied to the potato plant and has small spiny balls filled with black seeds which are easily distributed and cling readily to passing animals. It closely resembles the horse nettle, but is distinguished from it in being more bushy and lighter. Its spread may be checked by preventing its seeding whenever the yellow flowers appear, and by thorough cultivation. See WEEDS.

Buffalo Grass, a strong-growing, nutritious North American grass, so called from once forming a large part of the food of the buffalo, or bison. The blades of this grass are about six inches long, and when burned by the summer sun they become crisp, curly and light brown in color. It is still a valuable fodder on the cattle ranges of the West.

Buffalo Moth. See CARPET BEETLE.

Buff Leather, a sort of leather prepared from the skin of the buffalo and other animals. It is dressed with oil, like chamois, and it is very soft and flexible. Belts, pouches, gloves and other articles are made from it.

Buffon, *bu foN'*, GEORGE LOUIS LECLERC, Count de (1707–1788), a celebrated French naturalist and philosopher, born at Montbard, in Burgundy. In 1739 he was elected a member of the Academy of Sciences, and in the same year he was appointed superintendent of the Royal Gardens at Paris (now the *Jardin des Plantes*), where he devoted his time to the study of natural history and prepared his great life work, *Natural History*.

Bug, the name given to any insect belonging to the order Hemiptera. The beak is bent toward the breast and is adapted for sucking or piercing. Among the most common and troublesome bugs are the bedbug, chinch bug and louse. In the United States the word is used synonymously with beetle.

Bug'gy, in the United States, the name given a light, one-horse, four-wheeled vehicle, with or without a top or hood. In England, however, the term means a light, one-horse, *two*-wheeled vehicle, with or without a hood, such as, in the United States, is called a *cart*.

TOP BUGGY

Bu'gle, a wind instrument, resembling the trumpet but having a shorter tube and a smaller bell-shaped opening. Its chief use is in sounding the call in cavalry regiments, as the trumpet is used with infantry. In peace the soldier is reminded of every routine duty by a special call from a bugler, while in war his marches and movements are directed and guided by its calls.

Buhlwork, *bule'wurk*, a form of art consisting of inlaid decoration, used especially in cabinet work and said to have been invented by André Charles Boule, a French cabinetmaker, in the reign of Louis XIV. It consisted at first of unburnished gold, brass, enamel or mother-of-pearl, worked into designs of flowers, landscapes and varied scenes and inserted in a ground of dark-colored metal, wood or tortoise shell; but at a later period the use of wood of different colors was introduced by Reisner, and to his process the modern practice of buhlwork is chiefly confined. The work is done with veneers.

Buhrstone, *bur'stone*, a hard, coarse-grained rock, composed principally of quartz which contains small fossils. When dressed, buhrstone presents a rough surface, valuable for cutting or grinding. For this reason it has been extensively used for millstones. Buhrstone is found in France, Belgium, Scotland and Alabama. That found in France is the most valuable, and before the invention of the present process of manufacturing flour most of the millstones in the United States came from these quarries.

Building, *bild'ing*, the art of constructing buildings; also, the structure erected. Building includes all those mechanical operations necessary to fashion or construct the materials and to erect these materials into a finished structure. The most important trades connected with building are carpentry, masonry, brick-laying, plastering, iron-working, quarrying, painting and glazing. Taken together, these are often spoken of as the *building trades*. There are also numerous other industries closely related to building, but classed as manufactures, such as the making of brick, glass, nails, screws and other hardware, all of which are used in building.

The main parts of a building are the foundation, the body and the roof. The *foundation* is of great importance. It should be firm and so laid that it will not move. The construction of foundations for small buildings is a simple matter. They are made of brick, stone or wood, but the last is seldom used except for temporary structures. Stone or brick foundations are laid in trenches, which should be deep enough to extend below the frost line. For country buildings rough stones called *rubble* are often employed. The foundations for large buildings, such as those erected in cities, often require the greatest of engineering skill. They must be sufficiently strong to support the weight of the building and must rest upon soil or rock which will not move. The kind of foundation in such cases depends very largely upon the nature of the soil and the weight of the structure. Where a firm foundation cannot be reached except by excavating to a great depth, piles are often used. These are driven down until they reach a rock or other layer which will hold them firmly, their tops are then fastened together by wooden or iron beams, and the space between is filled with concrete. This makes a very firm foundation and one which will support a building of great weight. A more recent plan is to use concrete pillars instead of piles. These are made by excavating a round hole, until the rock below is reached, and then filling this with concrete, so as to make a firm support. The supports of the building are then placed upon these concrete pillars.

The *body* of the building is designed to meet the requirements for which the structure is erected. It may be of wood, brick or stone. When the exterior walls are of brick or stone they seldom need a frame, and the framework necessary is that for supporting the partitions and floors. However, if the building is of wood, the frame is erected first, then this is covered on the outside with boards and siding, and on the inside with lath and plaster. The partitions are built in a similar way. In large cities buildings are now generally constructed with steel frames. The frame consists of girders of rolled steel, which are strongly riveted together and braced. These girders contain ledges, upon which the brick or stone forming the exterior walls is supported. Such buildings are very strong and contain much less material in the exterior walls than would be necessary were the steel frame dispensed with. By using tiling for partitions and floors, steel-frame buildings can be made so that they are practically fireproof. Some of these structures in New York City exceed thirty stories in height, and the Masonic Temple in Chicago is twenty-one stories high, but sixteen stories is the usual limit allowed.

The style of *roof* of the building depends upon the size and style of the building. Small buildings usually have roofs sloping from the middle downward to the sides, forming what is called a double roof. The triangular ends of such buildings are known as *gables*. Tall buildings have a flat roof, which has a slight incline to one side. Roofs are covered with shingles, slate, tin or tar and gravel. The shingles and slate are generally used for steep roofs, and tin or gravel for the flat roofs. See ARCHITECTURE.

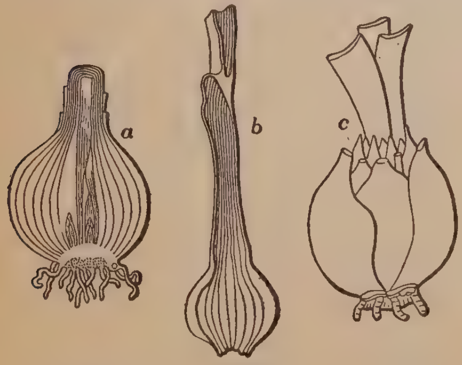
Building and Loan Associa'tions or **Building Societies,** joint-stock benefit societies for the purpose of raising by periodical payments a fund to assist members in obtaining landed property and houses. These are mortgaged to the society till the amount of the shares drawn on shall be fully repaid with interest. These societies may be divided into two classes, *proprietary* and *mutual*. The former take money on deposit, paying interest therefor, and give loans for building purposes, or the like, repayable by installments. The profit of the company lies in the difference between the rate charged to borrowers and the rate paid to depositors. In the mutual societies, each depositor becomes, to the extent of his deposit, a stockholder. One who wishes to borrow money to invest in land or to build a home may subscribe for a certain number of shares, equal in value to the amount of money he borrows, mortgaging his property as security. He pays for this stock by small periodical installments (usually weekly or monthly) until the stock is paid for. Thereupon he surrenders his stock and his mortgage is canceled. Many states have strict laws governing such institutions.

Building-stone, stone suitable for the construction of buildings, foundations, piers and other like structures. Granite, slate, limestone, marble and sandstone are the building-stones in most common use in the United States. There are numerous other stones, however, suitable for finishing interiors, such as serpentine and onyx. Granite is the strongest and slate the most durable of building-stones. Dolomite is an excellent building-stone and is extensively used in England.

All stone disintegrates from the action of the air and moisture. If porous, like limestone, it absorbs a great deal of water, and the contraction and expansion of this in freezing and thawing destroy the stone. For this reason soft sandstones are not durable for exteriors. Other stones do not usually absorb enough moisture to be injured in this way, though stones containing iron, or other substances which the water dissolves, frequently become discolored. Stone generally withstands weather best when used near the locality where it is quarried. A kind of artificial stone known as *concrete* is now in quite general use in the place of building-stone.

Bulacan, *bu lah kahn'*, a town on the island of Luzon, Philippine Islands, 22 mi. n. w. of Manila, with which it is connected by river. It is composed principally of native huts. The chief industries are sugar-boiling and the manufacture of silk matting. The town was an important military point during the insurrection following the occupation of the islands by the United States. Since the war it has been made a military post. Population, about 14,000.

Bulb, a modified leaf-bud formed on a plant, either upon the ground or beneath its surface. Roots grow from the base, and from the center a stem grows. The bulb is formed by the bases of leaves or by thin coats and layers, which are, in reality, modified leaves. The function of a bulb is to store nourishment to enable plants to complete their growth more rapidly than would be possible from the seed. The onion, tulip and common lily are good examples of bulbs.



BULBS
a, section of onion bulb; *b*, leaf from onion bulb; *c*, bulb of lily.

Bulbul, *bull'bull,* the Persian name of the nightingale, rendered familiar in English poetry by Moore, Byron and others.

Bulga'ria, a principality tributary to Turkey, situated in the southeastern part of Europe. It is bounded on the n. by Rumania, on the e. by the Black Sea, on the s. by Turkey and on the w by Servia. The area is 37,200 square miles, or a little greater than that of Indiana. The Balkan Mountains traverse the country from east to west, and other ranges extend across it in various directions, so that nearly all of the surface is mountainous or hilly. The highest summits do not exceed 10,000 feet. Bulgaria is drained by the Danube and its tributaries and the Kamtchik, while the southern portion, or Eastern Rumelia, is drained by the Maritza, which flows southward into the Aegean Sea.

The country has a temperate climate, averaging cooler in the uplands than along the coast of the Black Sea. The winter usually lasts from November till March, except in the southern portion, where it is much shorter. The rainfall throughout is sufficient for agriculture.

The mineral industries are decidedly limited. Deposits of gypsum and coal are found, and there is some iron and peat, but these are not worked to a sufficient extent to give them any industrial importance. The soil is fertile and the climate favorable for agriculture; consequently, this industry employs a large part of the inhabitants. The methods employed are very primitive, yet good crops are usually obtained. The land is divided into small holdings and is leased from the government, with the exception of forests and pasture land, which are held in common, without rental. The largest crops are wheat, corn, barley, oats, rye and potatoes. Fruits and vegetables are grown with success, and in some portions of the country roses are raised for export.

The Danube is navigable; there are a number of seaports on the Black Sea, and about a thousand miles of railway have been completed. Most of the commerce is carried on over the waterways. The exports consist of live stock, grain, tobacco, fruit, attar of roses and textiles, while the imports include coal, machinery, tools, firearms and other manufactured goods. Most of the foreign trade is with Austria-Hungary, Germany, Great Britain, France and Turkey.

The principal towns are Sofia, the capital, Philippopolis and Varna, the chief seaport. At the Congress of Berlin in 1778, Bulgaria was made a constitutional monarchy, but was placed under the suzerainty of the Ottoman Empire, to which it pays tribute. In 1885 Eastern Rumelia was joined to Bulgaria. The country is governed under a constitution, which places the executive power in the hands of the chief ruler, who has the title of prince. The legislative department consists of a national assembly, composed of one deputy for every 20,000 inhabitants and elected by general suffrage. The executive department is divided into eight subdepartments, each in charge of a minister, and these ministers constitute the prince's advisory council. The judiciary consists of district courts, and local courts under justices of the peace. There are also higher courts of appeal and a supreme court at the capital.

The bulk of the population consists of Bulgarians, who are a branch of the Slavs. They preserve the Bulgarian language, and in religion generally belong to the Greek church, though there are a few Christians of other faiths in the country. There are also some Mohammedans. In the autumn of 1908, Bulgaria, under the leadership of Prince Ferdinand, declared its independence from Turkey and the Prince assumed the title of Czar.

Bull, a letter, edict or rescript of the pope. It is published or transmitted to the churches over which he is head, and contains some decree, order or decision. In many cases a leaden seal, impressed on one side with the heads of Saint Peter and Saint Paul, on the other with the name of the pope, is attached to the bull. If the bull be a "Bull of Justice," the seal is attached by a cord or hemp; if a "Bull of Grace," the cord is of red or yellow silk. Pope Leo XIII ordered the use of ordinary, instead of Gothic, characters on the less important bulls.

Bull, John, the name used to signify the personification of the English people. It was first used in Arbuthnot's satire, *The History of John Bull*, designed to ridicule the duke of Marlborough.

Bull, Ole Bornemann (1810–1880), a famous violinist, born at Bergen, Norway. Though suffering many early misfortunes, he achieved great triumphs both in Europe and in America, chiefly on account of his wonderful technique, which probably has never been surpassed. Though self-taught, he gained by close study a thorough acquaintance with the old masters, and his interpretation of their works was unusually appreciative. Having lost all his money in a scheme to found a colony of his countrymen in Pennsylvania, he afterward settled near Cambridge, Mass., where he spent most of his later life. He died in Norway.

Bull'dog, a variety of the common dog, having a short, broad muzzle and a projecting lower jaw which causes the lower front teeth to protrude beyond the upper. The head is massive and broad, the lips are thick and loosely hanging, the ears drooping at the extremity, the neck thick and short, the body long and stout, and the legs short and sturdy. The bulldog is a savage animal, better suited for fighting than for any purpose requiring activity and intelligence. It has a very obstinate nature, and when once it has fastened its teeth in an enemy it will hold on in spite of awful punishment. For this reason it is often employed as a watchdog and was formerly used in the barbarous sport of bull-baiting. Bulldogs show great affection for their masters, but are liable to be surly and vicious with strangers. The *bull terrier* came originally from a cross between the bulldog and terrier. It is smaller than the bulldog, lively, docile and very courageous.

Bull'er, Redvers Henry, Sir (1839–), a British officer. His victories in the Ashanti, Kaffir and Zulu campaigns, in the Boer war of 1881 and in the Sudan campaign in 1884 and 1885 won him various honors and led to his appointment in 1899 as commander in chief of the British troops in the South African War. He proved himself, however, incapable of mastering the situation, and after a number of reverses he was recalled and superseded by General Roberts. See South African War.

Bull'et, a projectile intended to be discharged from such firearms as a rifle, musket, pistol or revolver. Bullets formerly were solid spherical masses, but of late many changes have been made in their shape and structure. Those used for rifles of recent construction are elongated and generally rounded or conical at the apex, somewhat like half an egg drawn out. They are sometimes made of lead covered with copper, but the fact that copper poisons the wound has caused such bullets to be little used. For a similar reason, bullets that flatten when they strike an object are condemned in modern warfare, because of the ragged wound they make.

Bull′fighting is among the favorite diversions of the Spaniards. The fights are usually held in an amphitheater having circular seats rising one above another, and are attended by vast crowds who eagerly pay for admission. The combatants, who make bullfighting their profession, march into the arena in procession. They are of various kinds—the *picadores*, combatants on horseback, in the old Spanish knightly garb; the *banderilleros*, combatants on foot, in gay dresses, with colored cloaks or banners; and lastly, the *matador* (the killer). As soon as the signal is given, the bull is let into the arena. The *picadores*, who have stationed themselves near him, commence the attack with their lances, and the bull is thus goaded to fury. Sometimes a horse is wounded or killed and the rider is obliged to run for his life. The *banderilleros* assist the horsemen by drawing the attention of the bull with their cloaks and try to fasten on the bull their *banderillos*—barbed darts ornamented with colored paper, and often having squibs or crackers attached. If they succeed, the squibs are discharged, and the bull races madly about the arena. In case of danger they save themselves by leaping over the wooden fence which surrounds the arena. The *matador* now comes in gravely with a naked sword and red flag and aims a fatal blow at the animal. The slaughtered bull is dragged away and another is let out from the stall. During the season at Madrid there is at least one fight a week, and eight or more bulls are sacrificed in a single afternoon. It is not often that a man is injured.

Bull′finch, a favorite cage bird of the Germans. Its body is a bluish-gray, with bright red on the breast. The crown of the head is black, as is also the short, thick, rounded bill. Bullfinches are found wild in Britain, southern Europe and Asia, are readily tamed and may be taught to sing a great variety of musical airs.

Bull′frog, a frog found in most parts of the United States and Canada, but chiefly abundant in the Southern states. It is of a large size, sometimes measuring as much as a foot in length, and is of an olive-green or reddish-brown color, with large brown or black spots and with a yellow line along the back. It receives its name from the remarkable loudness of its voice, which is a hollow bass that can be heard distinctly for a long distance. The bullfrog inhabits swamp lands around lakes. In feeding it does not confine itself to insects and worms, as do the smaller frogs, but eats fish and other frogs and the young of birds and animals. The hind legs of the frog are often used as food and also as bait for fish.

Bull′head. See CATFISH.

Bull Run, BATTLES OF, two important battles of the Civil War. The first, which was fought July 21, 1861, was the first important battle of the war. The Confederates, to the number of 31,000, were posted along Bull Run Creek. McDowell, who was commanding 28,000 Union soldiers, determined to attack their position, and he began by sending Tyler, Heintzelman and Hunter to turn the Confederate left wing. This movement was successful, but McDowell failed to follow up his advantage by occupying the strategic position at Manassas Junction, and chose to follow the fleeing enemy. After a time the Federals were repulsed by the forces of General Jackson, who there gained his sobriquet of "Stonewall." With the aid of reënforcements, Generals Joseph Johnston, Beauregard, Jackson and Kirby Smith directed a fresh attack and completely routed the Union forces. This victory of the Confederates spread consternation throughout the North and caused a corresponding elation among Confederate sympathizers.

The second Battle of Bull Run, also known as the Battle of Manassas, occurred August 29 and 30, 1862, between an army of 40,000 men, under General Pope, and a somewhat smaller Confederate force under "Stonewall" Jackson. The latter had occupied a strong position near Manassas Junction and was attacked at daylight, August 29, by General Sigel. The battle raged fiercely all that day, with the advantage slightly in favor of the Federals. General Longstreet reënforced Jackson at nightfall, and on the following day the exhausted Union troops were compelled to retire, leaving the Confederates in possession of the field. The disastrous ending of Pope's campaign enabled Lee to invade Maryland, and there was great fear in the North that he might advance to Washington.

Bulls and Bears. See BEAR AND BULL.

Bull's′-eye. 1. A round piece of thick glass, convex on one side (See LENS), inserted into the decks, ports or skylight covers of a vessel, for the purpose of admitting light. 2. A small lantern with a lens in one side of it, to direct the light in any desired direction. 3. In shooting, the center of a target, of a different color from the rest of it and usually round. See ARCHERY.

Bull′-trout, a large species of fish of the salmon family, thicker and clumsier in form than the salmon, but so like it as sometimes to be mistaken for it by fishers. It attains a weight of 15 to 20 pounds and lives chiefly in the sea, ascending rivers to spawn.

Bülow, *bü'lo,* FRIEDRICH WILHELM, Baron von (1755–1816), a Prussian general. He was actively engaged against the French at the earliest periods of the revolutionary war; and his services in 1813 and 1814, especially at Grosbeeren and Dennewitz, were rewarded with an estate and the title of Count Bülow von Dennewitz. As commander of the fourth division of the allied army he contributed to the victorious close of the Battle of Waterloo.

Bülow, HANS GUIDO VON (1830–1894), a pianist and composer, born at Dresden. He first studied for the law, but later he adopted music as a profession and studied the piano under Liszt. He made his first public appearance in 1852, with only moderate success, but in 1855 became leading professor in the Conservatory at Berlin, in 1858 was appointed court pianist and in 1867 musical director to the king of Bavaria. His most famous compositions include an overture and music to Shakespeare's *Julius Caesar*, an "orchestral ballad," *The Minstrel's Curse*, a symphonic poem, *Nirwana*, and numerous songs, choruses and pianoforte pieces. He is considered one of the first of pianists and orchestral conductors.

Buloz, *bü lo',* FRANCOIS (1803–1877), a French editor, who conducted, from 1831 to his death, the *Revue des Deux Mondes*, the celebrated French fortnightly literary magazine. From 1835 to 1845 he had charge, also, of the *Revue de Paris*.

Bul'rush, the popular name for almost any large, rush-like plants growing in marshes. It is most correctly given to a large species of scouring rush or equisetum. See HORSETAIL RUSH.

Bul'wer-Lyt'ton, EDWARD GEORGE EARLE, Lord Lytton (1803–1873), an English novelist. He graduated from Cambridge, spent some time in Paris, and on his return to England became estranged from his mother, because he made a marriage of which she did not approve. Obliged thus to provide for himself, he turned to literature, and plays and novels followed one another rapidly. From 1831 to 1841 and from 1852 to 1866 Bulwer was in Parliament, and he attained considerable influence. He was made a baronet in 1838, and raised to the peerage as Baron Lytton in 1866. Of Bulwer's plays, some of which have been very popular on the stage, the best known are *Richelieu, Money* and the *Lady of Lyons*; while among his novels may be mentioned *The Last Days of Pompeii*, the most popular of his works; *The Last of the Barons*, his greatest historical novel; *Rienzi, My Novel* and *The Caxtons*. Despite the affectation of Bulwer's style and of his sentiments, his books have always been popular because they have stories of interest to tell.

Bum'blebee, a large bee, well known in most parts of the world but particularly numerous in the northern hemisphere, where often it reaches the Arctic regions. Bumblebees live in small colonies, where about half the bees are workers and the remainder males and females. They are not so orderly or perfect in their family life as the honeybees, as may be seen in the roundish, oval, scattered cells of different size found in a single nest. Bumblebees collect honey and store it, but at the end of the season the colony breaks up and only a few females survive. One of their chief values seems to be the aid they render in the cross-fertilization of plants, and it is a curious fact that some species of clover cannot be grown successfully in countries where there are no bumblebees, for no other insect can fertilize the plants.

BUMBLEBEE

Bunce, *buns,* FRANCIS MARVIN (1826–1901), rear admiral of the United States navy. He graduated from the Naval Academy in 1857. At the opening of the Civil War he was placed in charge of the *Penobscot*, and he afterward had command in the land and naval engagement which resulted in the capture of a part of Morris Island, July 10, 1863. After the war he had charge of the Boston Navy Yard until 1869; in 1896 he commanded the fleet which maneuvered off Charleston, and he was in command of the Brooklyn Navy Yard during the Spanish-American War.

Buncombe, *bun'kum,* a term meaning talking for talking's sake, bombastic speech-making. It is said to have originated with a congressional member from the County of Buncombe of North Carolina, who declared that he was only talking for Buncombe, when attempts were made to cut short his lengthy speeches.

Bundesrat, *boon'des raht.* See Germany, subhead *Government.*

Bun'galow, in India, a house or residence, generally of a single floor. The native bungalows are constructed of wood, bamboo or like material, but those of the Europeans are generally built of sun-dried bricks and have a thatched or tiled roof. They are often very elegantly and richly furnished and invariably are surrounded by a veranda, the roof of which serves as a protection against the sun. Besides the private bungalows, there are military bungalows, used for the accommodation of soldiers, and public bungalows, built by the government along the main highways for the use of travelers

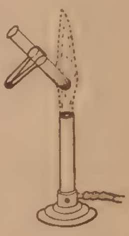
Bunion, *bun'yun,* an enlargement and inflammation of the joint of the great toe, arising from irritation of the small membranous sac located there. Bunions, which are usually caused by a tight shoe, begin in a small, tender spot, which swells and, if not cured, may become a very painful sore and cause a permanent deformity of the toe.

Bun'ker Hill, Battle of, one of the most important battles of the American Revolution, fought on June 17, 1775. The British army of 10,000, under Generals Gage, Howe, Clinton and Burgoyne, was occupying Boston. The American army, 15,000 strong, was commanded by General Artemas Ward, with headquarters at Cambridge. Learning that the British intended to seize Bunker Hill, overlooking Charlestown, the Americans silently, during the night, fortified the adjoining height, known as Breed's Hill. The British, discovering the redoubt at daybreak, opened fire from their ships of war in Charlestown Harbor. They finally landed a force and advanced upon the position of the Americans, but were repulsed with great loss. A second attack, during which Charlestown was burned, was no more successful. The British rallied for a third attack, and the Americans, after resisting with stones and the butts of their rifles, having exhausted their ammunition, drew off with inconsiderable loss. General Joseph Warren, one of the most prominent of the patriots, was among the killed. The loss of the British was about 1000. June 17, 1825, the fiftieth anniversary of the battle, the cornerstone of the Bunker Hill Monument was laid, among those present being Lafayette and Daniel Webster (See Bunker Hill Monument).

Bunker Hill Monument, a monument erected in commemoration of the Battle of Bunker Hill, and standing on the battle ground on Breed's Hill, now Bunker Hill, Boston. General Lafayette laid the cornerstone in 1825, at which time Webster delivered his famous address. The formal dedication took place in 1843. The monument is of granite and is 221 feet high. At the top is a chamber reached by a spiral staircase.

Bun'sen, Robert Wilhelm Eberard (1811–1899), an eminent German chemist. Among his many discoveries and inventions are the production of magnesium in quantities, magnesium light, spectrum analysis, the electric pile and the burner which bears his name.

Bunsen's Battery, a form of galvanic battery, the cells of which consist of cleft cylinders of zinc, within which is a porous earthen cup containing a rectangular prism or a rod of carbon. The outer cup, in which the zinc is placed, contains dilute sulphuric acid, and the earthen cup contains nitric acid. This battery works quickly and generates a strong current, but it is now little used, because more convenient patterns have replaced it.



BUNSEN'S BURNER

Bunsen's Burner, a form of gas burner especially adapted for heating, consisting of a tube, in which, by means of holes in the side, the gas becomes mixed with air before burning, so that it gives a non-illuminating, smokeless flame, producing intense heat.

Bunt, a disease of wheat, which is caused by the attack of a parasitic fungus. It is known also by the names smut ball, pepper brand and stinking smut. The diseased wheat takes on a bluish-green color and does not grow to its full height. The fungus is born in the ovary of the wheat and is formed when the wheat is young. It can do much injury to a crop, but can be prevented by careful selection and washing of the seed with water or solutions of copper sulphate, formalin or corrosive sublimate.

Bunt'ing, the popular name of a group of finches. In Britain the common bunting, or corn bunting, is seen in most cultivated districts, and in the arctic regions the snow bunting, or snowbird, is one of the few birds to be seen. In the United States the cowbird, or cow blackbird, is frequently called the cow bunting.

Bun'yan, John (1628–1688), author of *The Pilgrim's Progress.* He was the son of a tinker and was born at the village of Elstow, near Bedford. He followed his father's employment, but

LUTHER BURBANK

during the civil war he served as a soldier, probably on the side of Parliament. Having joined, largely through the influence of his wife, a society of Baptists at Bedford, he at length undertook the office of public teacher among them, and this defiance of the severe laws against dissenters led to his arrest and to his imprisonment for twelve years (1660–1672). During a second imprisonment in 1675, he finished his long religious allegory, *The Pilgrim's Progress*. This book, a vivid, dramatic picture of the spiritual life of man, has, it is said, been translated into more languages than any other book except the Bible. Bunyan's other work, often overlooked by reason of the superior merit of *The Pilgrim's Progress*, includes *The Life and Death of Mr. Badman*, *The Holy War* and *Grace Abounding*, an account of Bunyan's spiritual life.

JOHN BUNYAN

Buonarotti, *bwo nahr ro'te.* See MICHELANGELO.

Buoy, *boo'y,* or **Boy,** a floating object constructed of wood or iron and placed as a guide to navigation in rivers and harbors. There are a great many varieties of buoys, each constructed in the manner best suited to its particular purpose. For instance, the *can buoy* is an iron cylinder with a dome-shaped bottom. The *nut* or *nun buoy* is composed of two cones placed base to base. *Spar buoys* are merely wooden poles anchored and held upright by a heavy weight on their lower end. These are used where ice might destroy or carry away the can buoys. Some buoys are fitted with a lamp, which burns day and night; others carry bells which ring when the winds toss the buoy about, and still a third class is fitted with whistles, which are blown by air compressed and driven through them by the tossing waves. Charts of harbors locate the buoys, and all navigators understand not only the location of each, but the special information which each buoy can give. For instance, in the harbors of the United States the buoys are painted black on one side and red on the other. As a ship enters the harbor it sails so as to keep the red sides of the buoys on the starboard side of the ship. Danger buoys are painted with red and black horizontal stripes; mid-channel buoys have black and white stripes running vertically; while buoys that mark bad danger points are painted green. White buoys indicate safe anchorage.

Burbage, *bur'bij,* RICHARD (1567–1619), a famous actor, the contemporary of Shakespeare. He was a member of the same company as Shakespeare, Fletcher and others, and filled all of the greatest parts of the contemporary stage in turn. He was the original Hamlet, Lear, Othello and Richard III, and played the leading parts in the plays of Beaumont and Fletcher and Ben Jonson.

Bur'bank, LUTHER (1849–), an American naturalist, owner of a large experiment farm at Santa Rosa, Cal. He succeeded in producing many new and valuable forms of flowers, fruits, nuts, vegetables, grasses and trees. Among the flowers, he secured a brilliant crimson poppy from a yellow one, and he made the verbena take on the fragrance of the trailing arbutus. The Australian star-flower he developed into a new "everlasting" flower, in rose-pink and white colors, which may be used for the decoration of ladies' hats. He improved the quality of many fruits and produced several distinctively new kinds. The most remarkable of these are the plumcot, a combination of plum and apricot; the pomato, which grows on potato tops; and the strange freak of a white blackberry. He hardened trees till they are able to withstand colder climates, and he trained fruit trees till their buds and blossoms are not affected by frost. The worthless cactus he made to give up its thorns and to produce luscious, wholesome fruit. He raised blackberry bushes without stickers and improved the quality and size of tobacco. Plants have already been grown 10 feet in height, with leaves 2 feet wide and 3 to 4 feet long. These and other marvelous achievements have been the results of patient, painstaking labor, chiefly by cross-fertilization of many thousands of plants year after year, and the selection of the very few that give prospects of producing valuable results.

Bur'bot, a fish of the cod family, found in the streams of the United States, England, northern Europe and Asia, shaped somewhat like an eel, but shorter, with a flat head. It has two small barbs on the nose and another on the chin. It is called, also, *eel-pout* or *coney-fish.* It never enters salt waters. The *spotted burbot* is found in the American northern lakes and rivers. It is a coarse and tasteless fish and is not valuable as food.

BURBOT

Bur'dekin, a river of the northeast of Queensland, Australia, with a course of about 350 miles. With its affluents it waters a large extent of country, but it is useless for navigation.

Burdett-Coutts, *bur det' koots'*, Angela Georgina, Baroness (1814–1906), an English philanthropist. She inherited immense wealth, and became popular through the liberal use of it in public and private charities. In 1871 she received a peerage from the government, and in 1881 she married W. L. Ashmead-Bartlett, who assumed the name of Burdett-Coutts.

Burdette, *bur det'*, Robert Jones (1844–), an American clergyman and humorist, born in Greensboro, Pa. He attended public school at Peoria, Ill., and in 1862 joined the Forty-seventh Illinois volunteers, serving through the war. He wrote for several papers after the war and finally became associate editor of the *Hawkeye* of Burlington, Iowa, through which paper he became known as a humorist. He began to lecture in 1877 and ten years later became a licensed preacher in the Baptist Church. Among his books are *The Rise and Fall of the Mustache and Other Hawkeyetems* and *Chimes from a Jester's Bells.*

Bur'dock, the popular name of a coarse-looking weed with round flower-heads, the scales of which are furnished with hooks. In some countries the roots, young shoots and young leaves are used in soups, and the plant is cultivated with this view in Japan. It is a common, troublesome weed in the United States, especially where sheep are pastured. The plant is a biennial, and cutting down does not destroy it. The roots should be grubbed up before the plant has a chance to seed.

Bureau, *bu'ro,* a writing table or a chest of drawers. The word is also used to mean the chamber of an officer of government and, in consequence, a department of officials. *Bureau system,* or *bureaucracy,* is a term often applied to those governments in which the business of administration is carried on in departments, each under the control of a chief; or, more broadly, to the system of centralizing the administration of a country through regularly graded series of government officials.

Bureau of Amer'ican Repub'lics, a bureau organized as a result of the Pan-American Congress in 1889. It is under the control of the department of state, and comprises a committee, of which the secretary of state is the chairman, having one representative for each country belonging to the union.

The purposes of the bureau are to disseminate information between the countries associated, concerning the commercial conditions, trade and customs laws, patent, copyright and trade-mark laws, systems of weights and measures of each; to secure the adoption of a common legal-tender silver coin and to perfect a plan for the arbitration of all disputes. The bureau issues a monthly bulletin and an annual report, which are regarded as standards of authority.

Burgess, *bur'jes,* Frank Gelett (1866–), an American writer and artist of the fantastic, born in Boston and educated at the Massachusetts Institute of Technology. He worked as a railroad draughtsman, taught in the University of California, was a designer, wrote for and edited various magazines and lived in New York, London and San Francisco. He wrote the amusing *Purple Cow, Nonsense Almanack, Goopes and How to be Them* and many other like fancies.

Burgher, *burg'ur,* **Schools,** the name now applied to public schools of higher grade in the towns of Germany, designed to educate children for practical life. These schools take their name from similar schools established early in the Middle Ages, for the purpose of giving a more practical education than was provided by schools maintained by the Church, whose work was confined almost wholly to the study of Latin and the doctrines of the Church. The early burgher schools provided instruction in the mother tongue and arithmetic and the elements of geography. The teachers for these schools were usually selected by the local authorities instead of being provided by the Church. The organization and courses of study have gradually changed from time to time to meet the demands made upon them. Many of them are now known by other names, and they are practically identical with the *realschule*.

Bur'glary, "the breaking and entering by night into the dwelling house of another, with intent to commit a felony." Every important word in this definition conveys a part of the meaning which distinguishes the offense of burglary from others known as *larceny* and *robbery* in the common law. Various states have changed the definition of the crime by statute, so that it includes more than the above definition. The usual punishment is imprisonment, the maximum being rarely more than twenty years. The killing of a burglar in self-defense or in defense of family or property is not a crime.

Burgos, *boor'gos*, a city of northern Spain, 130 mi. n. of Madrid, once the capital of the kingdom of Old Castile and now the chief town of the province of Burgos. It stands on the side of a hill, on the right bank of the Arlanzon, and has dark, narrow streets full of ancient architecture, but there are also fine promenades in the modern style. The cathedral, commenced in 1221, is one of the finest examples of Gothic architecture in Europe. It contains the tombs of the famous Cid and Don Fernando, both natives of Burgos, celebrated throughout Spain for their heroic achievements in the wars with the Moors. Population, 31,415.

Burgoyne', JOHN (1722–1792), an English general of the Revolutionary War. After serving in various parts of the world, he was in 1777 appointed commander of an army against the Americans, and took Ticonderoga. A part of his army fought a battle at Hubbardton, a detachment of Hessians was defeated at Bennington, Vt., and on October 17 Burgoyne himself was forced to surrender with his whole army at Saratoga. He was coldly received on his return to England and deprived of his command, but Fox and Sheridan took his part and received his Parliamentary support. Latterly he occupied himself mainly with the writing of comedies, including *The Maid of the Oaks*, *The Lord of the Manor* and *The Heiress*, a play that still holds the stage.

Bur'gundy, the name of a large and important former province of France, deriving its name from the Burgundians, a Germanic nation which established a kingdom embracing a great part of the basin of the Rhone, in 408 A. D. Within a century they were conquered by the Franks. By the terms of the Treaty of Verdun in 843, there was a partition of the Frankish Empire, and a new kingdom of Provence, or Cisjurane Burgundy, was formed, founded by Boso in 879 and including Provence, Dauphiné, the southern part of Savoy and a tract between the Jura and the Saône. A little later Transjurane Burgundy was established, consisting of northwestern Savoy and the part of Switzerland between the Reuss and the Jura. In 933 these two kingdoms united under the name of Arles, and in 1032 the kingdom was bequeathed to Emperor Conrad II of Germany.

At the time of the union of the two kingdoms of Burgundy in 933, the northwestern portion remained a separate duchy, subject to the French crown and governed by a line of dukes from the House of Capet, which line became extinct in 1361. Dating from the accession of Philip the Bold, the territory and power of Burgundy constantly grew and increased in importance. On the death of Charles the Bold in 1477 the duchy was seized by Louis XI, king of France, and annexed to France. The old county of Burgundy was known as Franche-Comté. The Burgundy of to-day forms the department of Cotê-d'Or, Saône-et-Loire, Yonne, part of Ain and part of Aube. The chief towns are Dijon, Auxerre, Chalon-sur-Saône and Macon.

Burgundy Wines, wines produced in the former province of Burgundy, especially in the Department of Cotê-d'Or. In richness of flavor and all the more delicate qualities of the juice of the grape, they are inferior to none in the world. See WINE.

Burial, *ber'e al*, the mode of disposing of the dead. Different peoples adopt different methods of burial. The savage races expose the bodies to wild animals or birds of prey; the Hindus throw their dead into the Ganges River, and the Egyptians embalm the bodies and preserve them inviolate in costly tombs. However, the two most common methods have been interment and burning. Both forms were practiced among the Greeks and Romans, though burning, or cremation, came to be almost the sole method during the later years of the Republic. The method of interring has varied; in some cases, as with the early Babylonians, the bodies were placed on the surface of the ground and mounds were raised over them, while in other cases deep graves were dug, or elaborate buildings constructed, to contain the urns or coffins in which the bodies were sealed. Among civilized nations of to-day cemeteries are set apart, in which the bodies are buried, as after the introduction of the Christian religion the practice of cremation almost entirely disappeared. Latterly, however, it has been revived, and it is considered by many persons to be a more sanitary method, since it is certain that in many cases the hillside cemetery proves a source of contamination to the water supply of town and city. See CREMATION; EMBALMING.

Buriats, *boo re ahts′*, a nomadic Tartar people, allied to the Kalmucks, inhabiting that portion of Siberia around Lake Baikal. Their number is about 250,000. They live in huts called *yurts*, which in summer are covered with leather, in winter, with felt. They support themselves by their flocks, by hunting and by the mechanical arts, particularly the forging of iron.

Bu′rin or **Graver,** an instrument of tempered steel, used for engraving on copper and steel. It is of a prismatic form, having one end attached to a short wooden handle, and the other ground off obliquely, so as to produce a sharp, triangular point. The burin is held in the palm of the hand and is pushed forward so as to cut a portion of the metal. See ENGRAVING.

Burke, EDMUND (1729–1797), a noted British writer, orator and statesman, who applied himself both to literature and to law, though chiefly the former. In 1756 he published his essay *On the Sublime and Beautiful*, which procured him the friendship of some of the most notable men of his time. The great question of the right of taxing the American colonies was then occupying Parliament, and while Burke was a member for Bristol he made several wonderful speeches in which he criticised the measures of the ministry with regard to the colonies and advocated a policy of justice and conciliation. His speech *On Conciliation with America* is one of the finest examples of argumentative oratory in existence. In 1782 Burke was made paymaster general of the forces, and after the change of ministry in 1783 he took an active part in the famous impeachment trial of Warren Hastings. The clearness and eloquence of his oratory and his remarkable mastery of detail in the consideration of this case have never been surpassed. In his later struggles to combat the ideas and doctrines of the French Revolution he was separated from the Liberals and his old friend Fox, and from this time on until his withdrawal from Parliament in 1794 he was a consistent opponent of Revolutionary ideas.

Burleigh, *bur′ly*, LORD. See CECIL, WILLIAM.

Burlesque, *bur lesk′*, a literary composition which excites laughter by its travesty of some other work or by a ludicrous mixture of things high and low. High thoughts, for instance, are clothed in commonplace language; high sounding words may be used to describe insignificant thoughts or facts. The most famous of the early writers of burlesque in England was Chaucer, who ridiculed some of the bombastic and long-drawn-out tales of the Middle Ages. *Don Quixote*, the most famous example of this class of works, was originally intended as a burlesque on the absurdly romantic tales of chivalry. As a form of the drama, burlesque was well known to the Greeks, and it has persisted steadily wherever dramatic forms have been cultivated. The dramas of W. S. Gilbert contain the strain of burlesque in their travesty of fads and affectations, but at present the burlesque means rather a mixture of travesty, vaudeville and ballet.

Bur′lingame, ANSON (1820–1870), an American statesman, born in New York State. He graduated in law at Harvard in 1846, began to practice at Boston, became a state senator in 1853, entered Congress in 1854 and remained there until March, 1861. He was challenged in 1856 by Preston S. Brooks, whose brutal assault upon Charles Sumner he had denounced in scathing terms. The duel was never fought. He was sent in 1861 as United States minister to China, and when he was recalled, in 1867, the Chinese government engaged his services as their diplomatic representative in Europe and America. He negotiated, in 1868, the treaty known by his name, between the United States and China, by which the latter first subscribed to the principles of international law.

Bur′lington, IA., the county-seat of Des Moines co., on the Mississippi River, 206 mi. s. w. of Chicago. The city is a railroad center, the Chicago, Burlington & Quincy intersecting here a number of other roads. There are extensive railroad shops; and the other importan industries include pork packing and the manufacture of agricultural implements, machinery, baskets, pearl buttons and furniture. The surrounding country is agricultural. The city has a public library, Burlington Institute College and a large auditorium with a seating capacity of 7000. The city was first settled in 1833, and was the first capital of the territory. Burlington adopted the commission form of government in 1910. Population in 1910, 24,324.

Burlington, N. J., a city in Burlington co., on the Delaware River, 18 mi. above Philadelphia, and on the Pennsylvania railroad. The place was settled, under the name of New Beverly, by Friends in 1677. The name was changed to Bridlington in honor of the Yorkshire town of that name. The pronunciation was Burlington; so the spelling was later changed to accord with it. There are manufactories of canned goods, shoes, stoves and other articles. The city has many fine old residences. Its important institutions include Saint Mary's church, which was endowed by Queen Anne, the state Masonic home, Burlington college and Saint Mary's Hall, an old Church school for girls. Population in 1910, 8336.

Burlington, Vt., a city of Chittenden co., on Lake Champlain, about 250 mi. n. of New York on the Rutland and the Central Vermont railroads. The city has an excellent harbor and is a very important lumber market. The manufactures include furniture, woolen and cotton goods. There are many charitable and educational institutions located here, among which are the State University of Vermont, Mary Fletcher Hospital and Bishop Hopkins Hall. The important buildings include the Fletcher Free Library, the Roman Catholic cathedral and Saint Paul's Episcopal church. The town was first settled about 1780. Population in 1910, 20,468.

Bur'ma, a province of British India, lying to the east of the Bay of Bengal. It is bounded on the n. by Tibet, on the e. by Yun-Nan, French Indo-China and Siam, on the s. w. by the Bay of Bengal and on the w. by Bengal, Manipur and Assam. Its extreme length from north to south is nearly 1250 miles. The area of the province is about 175,000 square miles, and with the dependencies known as the Shan states, about 245,000 square miles, or a little less than that of Texas.

A large part of the surface is hilly or mountainous. The country is situated near the eastern extremity of the Himalayas, and mountain ranges traverse it from north to south. The maximum elevation of the range west of the Irrawaddy is about 8500 feet, while on the northwest border the Patkoi hills rise to a height of 12,890 feet, with one summit exceeding 18,600 feet. The land along the river valleys and the coast is low.

The Irrawaddy drains the greater part of the country and flows southerly through the middle portion. To the east of this is the Salwin, which, with its tributaries, drains the eastern portion. These are the only very important rivers.

In the north, owing to the elevation, the climate is temperate, but with this exception the country has the climate characteristic of the torrid zone. The lowlands are generally unhealthful to Europeans, and the wet and dry seasons follow the monsoons. During the summer these winds blow from the southwest and cause a heavy rainfall along the coast and up the river valleys. On the coast ranges the annual rainfall varies from 120 to 160 inches, but in some localities among the mountains it is much greater than this. The mean temperature in the lowlands is from 80° to 90°, while in the interior it ranges from 50° to 60° in winter, and from 80° to 90° in the summer.

Mineral Resources. Gold is found in the sand and gravel along some of the rivers, and silver, lead, copper, antimony, iron and tin are mined in limited quantities. There are also deposits of amber and serpentine and an abundance of coal and petroleum. Precious stones, including jade, rubies and sapphires, are often found in the sand and gravel in the northern part of the province. The mines have not as yet been developed, and the methods employed in working them are decidedly primitive. Some quarries are worked, and a good quality of serpentine, also of white marble, is obtained.

Agriculture is the leading industry. The land is leased from the state, the rent constituting an annual tax. The principal products are rice, oil seeds, cotton, tobacco, sugar cane, tea and indigo. Rice is by far the most important product, and Burma is the leading country of the world in its production. Manufactures are few and limited and consist principally of the weaving of silk and cotton textiles. Some of the inhabitants are skillful workers in wood and gold, and their products are of considerable artistic value.

Railways extend from Rangoon to Mandalay, and from Rangoon to Thayetm-yo and other important towns. The Irrawaddy is navigable, and there are three canals connected with it.

Since the British occupation, the carriage roads have been greatly improved. The commerce consists in the exportation of rice and other agricultural products, and the importation of textiles, metals and other manufactured products and some food products. Most of the foreign trade is with China and Great Britain.

The country is governed as a province of British India. The chief executive officer is a lieutenant governor, and he is assisted by a legislative council. For local administration the province is divided into eight divisions, each in charge of a commissioner. The divisions are again subdivided into districts. By far the larger portion of the inhabitants are Buddhists. The remainder are divided among Mohammedans, spirit worshipers and Christians. The principal towns are Mandalay, Rangoon and Maulmain. The first two are described under their appropriate titles. Most of the inhabitants are native Burmese and belong to the Mongolian branch of the human family. The eastern highlands are inhabited by the Shans, and the hills to the north by the Karens, who still retain the habits and customs of the aboriginal tribes. The Burmese language is spoken, and the people have considerable literature, which is increased yearly by the publication of a number of books. Population in 1901, including the independent states, 10,450,000.

Burnand′, Sir Francis Cowley (1837–), an English humorist, educated at Eton and Trinity College, Cambridge, and admitted to the bar in 1862. He became the editor of *Punch* in 1880.

Burne-Jones, Edward (1833–1898), an English painter. He early adopted the profession of artist and came under the influence of Dante Gabriel Rossetti. He was one of the romantic school, known as the Pre-Raphaelites, who sought a return to the sincerity and purity of art that existed before the time of Raphael. He painted in water-color as well as oil, and his works are remarkable for richness of coloring as well as for poetic feeling. His subjects are from many sources—from the Bible, from Christian and heathen story and from the legends of King Arthur. Among his best known works are *Hope*, *Venus's Mirror*, *The Golden Stair* and *Wine of Circe*.

Bur′net, the popular name of two plants of the rose family. Both are common in Europe, where they are cultivated on dry soils as fodder plants. The smaller plant has been introduced into America, and now grows wild in northeastern United States and Canada.

Burnett′, Frances Eliza Hodgson (1849–), an American novelist, born in Manchester, England. She came to this country in 1865 and in 1873 she married Dr. S. M. Burnett. Her best known works are *That Lass o' Lowrie's*, *Haworth's*, *A Fair Barbarian*, *Through One Administration*, *A Lady of Quality*. *In Connection with the DeWilloughby Claim* and *Little Lord Fauntleroy*, her most successful work, which has also been very popular in its dramatized form.

Burn′ham, Sherburne Wesley (1838–), an American astronomer, born at Thetford, Vt., and educated in Thetford Academy. He began life as a stenographer and followed this calling until he was appointed clerk of the United States circuit court for the northern district of Illinois, which position he held for a number of years. While practicing stenography, he took up the study of astronomy as a recreation and became deeply interested in the subject. He soon acquired remarkable skill for an amateur, and in 1876 he became connected with the Chicago Observatory. From this position he went to the Lick Observatory, when that was opened, and on the opening of the Yerkes Observatory he was appointed professor of practical astronomy in the University of Chicago. He has been remarkably successful in discovering and cataloguing double stars, his discoveries along this line far exceeding those of any other observer. He has published a catalogue of stars discovered by him since the founding of the Yerkes Observatory in 1900.

Burn′ing. See Combustion.

Burning Glass, a lens having both surfaces curved outward, so that it is thick in the center and thin at the edges. When the sun's rays pass through such a lens, they are all brought to a point called the focus. The heat at the focus is sufficient to set on fire wood, paper and similar substances. Glass globes when filled with water and set in the sun act as burning glasses and occasionally cause serious damage. See Lens.

Burn′isher, a blunt, smooth tool, used for smoothing and polishing a rough surface by rubbing. The burnisher used by engravers is made of tempered steel and has slightly curved, polished sides and a rounded point. See Engraving.

Burn′ley, a city of England on the river Burn, 22 mi. n. of Manchester. It is a modern town, with well-planned streets and excellent buildings, most of which are constructed of stone. The important structures are the town-hall, an exchange, a market hall and several churches. The city also has a mechanics' institute, a technical school, a grammar school, numerous public schools and Victoria Hospital. The leading manufactures are cotton and worsted goods and foundry products. There are also machine shops, collieries and quarries in the vicinity. The waterworks, gas and electric light plants, public markets and slaughter houses are owned by the municipality. Population in 1901, 97,000.

Burnoose′, a large, loose garment or mantle, used by the Bedouin Arabs and the Berbers of northern Africa, commonly made of white wool, but sometimes also of red, blue, green or some other color, and having a hood which may be drawn over the head in case of rain. The Spanish *albornoz* is the same as the burnoose.

Burns, Robert (1759–1796), the great lyric poet of Scotland, born near Ayr, January 25, 1759. His father, a gardener, and latterly a small farmer, was very poor, but did the best he could to educate his children. Robert Burns was instructed in the ordinary branches by a teacher engaged by his father and a few neighbors. To these common branches Robert afterward added French and a little mathematics, but most of his education was obtained from general reading, to which he devoted himself earnestly. In this manner he learned what the best English poets might teach him and cultivated the instinct for poetry which was a part of his nature. At an early age he had to assist in the labors of the farm; and when only fifteen years old he had to do the work of a man. In 1781 he went to learn the business of flax dresser at Irvine, but the premises were destroyed by fire, and he was forced to give up the scheme. His father died in 1784, and Robert took a small farm, Mossgiel, in conjunction with his younger brother, Gilbert. Here he began to write poems which attracted the notice of his neighbors and gained him considerable reputation with educated men. This is not strange when we consider that such poems as *The Cotter's Saturday Night, To a Mouse* and *The Jolly Beggars* were produced at this time

ROBERT BURNS

His unhappy love affair with Jean Armour of Mossgiel decided him to emigrate to Jamaica and engage himself as assistant overseer on a plantation there. To obtain the funds necessary for the voyage, he published by subscription a volume of his poems, in 1786, and was about to set sail from his native land, when he was drawn to Edinburgh by a letter from an eminent man there, recommending that he should take advantage of the general admiration his poems had excited and publish a new edition of them. This advice was eagerly adopted, and the books sold far better than he had dared to hope. After remaining more than a year in Edinburgh, admired, flattered, and received in the highest society, he retired to the country with about $2500, which he had realized by the second publication of his poems. A part of this sum he advanced to his brother, and with the remainder he took a farm at Ellisland, near Dumfries. In 1788 he was appointed to the office of exciseman, and his duties were conscientiously performed. He married Jean Armour in 1788. It was during his residence on this farm that he wrote, in a single day, *Tam O'Shanter.*

The farming at Ellisland was not successful, and in about three years Burns removed to Dumfries and relied on his employment as an exciseman alone. He continued to write and composed a number of beautiful songs adapted to old Scottish tunes. But his residence in Dumfries, and the society of the idle and the dissipated who gathered around him there, attracted by the brilliant wit that gave its charm to their meetings, had an evil effect upon Burns, whom disappointment and misfortunes were now making somewhat reckless. In the winter of 1795 his health, strained by cares and dissipations, began to give way; and in the following summer he died. He left a wife and four children, for whose support his friends and admirers raised a subscription. Burns was an honest, proud, friendly, warm-hearted man, combining sound understanding and a vigorous imagination with the high passions which were his misery and ruin. His poetry, at its best, when written in the Scottish dialect rather than in formal English, is marked by a tenderness, a simplicity, a close touch with life, which prove him among the greatest of the world's songwriters.

Burns and Scalds are injuries produced by excessive heat on the human body. They are generally dangerous in proportion to the extent of surface they cover. Congestion of the brain, pneumonia, inflammation of the bowels or lockjaw are diseases which may follow an extensive burn. Hence, the treatment should be both local and constitutional. If there is shivering or exhaustion, hot brandy and water may be given with good effect, and if there is much pain, a sedative solution of opium. The local treatment consists in dredging the burn with fine wheat flour. An application of equal quantities of olive oil and lime water, called carron oil, is highly recommended by some. The wound should always be covered by cotton wool, or some other substance which will exclude the air. If blisters have formed, they may be opened delicately with a needle, the loose skin being kept in its place as a covering.

Burn'side, Ambrose Everett (1824–1881), an American soldier. He graduated from the military academy at West Point in 1847 and went to Mexico as second lieutenant of Third Artillery. In 1852 he resigned his commission and engaged in the manufacture of firearms. At the beginning of the Civil War he took command of a regiment from Rhode Island and took part in the first Battle of Bull Run. Later he was made brigadier general of volunteers and was ordered to Annapolis, Md., to organize a "coast division," intended to operate along the lower Potomac and Chesapeake Bay. In 1862, as commander of the Department of North Carolina, he captured the Confederate garrison on Roanoke Island. He then relinquished the Department of North Carolina and was transferred to the Army of the Potomac, was twice offered the chief command of the Army of Virginia and declined. His force held, with great loss of life, the stone bridge at Antietam, which was the important post of the battle, and when, after that battle, General McClellan was relieved, Burnside took the command. After the disastrous Battle of Fredericksburg he was superseded by Hooker and transferred to the Department of the Ohio. In August, 1863, he crossed the Cumberland Mountains to Knoxville, where he lay fortified for a siege. General Sherman relieved him, and he devoted himself to reorganizing the ninth corps. During 1864 and 1865 he served under Grant and took part in all the important battles. After the war he was connected with various railroad enterprises, was governor of Rhode Island from 1866 to 1869, and from 1875 to his death was in the United States Senate.

Burnt Off'ering, something offered and burnt on an altar as an atonement for sin; a sacrifice. The burnt offerings of the Jews were either some clean animal, as an ox, a sheep, a pigeon; or some species of vegetable substance, as bread, flour, ears of wheat or barley.

Burr, Aaron (1756–1836), an American statesman, born at Newark, N. J. He graduated at Princeton College, of which his father and grandfather (Jonathan Edwards) had been presidents, and in 1775 joined the patriot army. There he gained a high reputation, rising to the rank of lieutenant colonel. Retiring in 1779, he was admitted to the bar, soon became a leader in his profession, was elected attorney general of New York and in 1791 United States senator.

In 1800 he was a candidate for president of the United States, and received the same number of electoral votes as Jefferson, but the House of Representatives, chiefly through the influence of Hamilton, elected Jefferson, and Burr became vice-president. This disappointment, and a subsequent defeat in a contest for the governorship of New York, which he also attributed to Hamilton's influence, with good reason, led him to force a duel upon his great rival. The meeting took place at Weehawken, not far from New York City, July 11, 1804. At the signal, Hamilton fired into the air, but he fell mortally wounded at Burr's first shot.

Burr, branded a murderer by the people, fled to South Carolina, and though indicted for murder, returned after the excitement had subsided and completed his term as vice-president. But his political prospects in the United States were destroyed, and he therefore prepared to raise a force to conquer Texas, establish there a republic, with himself at its head, which might detach the Western states from the Union and give him vengeance for past injuries and failures. His scheme had progressed to an advanced stage, when the enterprise was detected, and Burr was tried for treason (1807). Though acquitted, his reputation was ruined. He spent some wretched years in Europe, and in 1812 returned to his law practice in New York. Here, shunned by society, he died on Staten Island, in a home given him by a friend.

Bur'rard Inlet, an arm of the Gulf of Georgia projecting into British Columbia, just north of the United States boundary. It is nine miles long and forms an excellent harbor. Vancouver, the terminus of the Canadian Pacific railroad, is situated on its north shore.

Bur'rillville, R. I., a town of Providence co., about 22 mi. n. w. of Providence. It has numerous manufactures of cotton and woolen goods. Population in 1910, 7878.

Bur'ritt, Elihu (1811–1879), an American writer and lecturer, known as the "learned blacksmith," born at New Britain, Conn. He was apprenticed to a blacksmith, but studied diligently in the intervals of his work and acquired proficiency in the ancient and most modern languages of Europe. Later he came into public notice as a lecturer on temperance and on the abolition of slavery, and he founded papers, missions and organizations to further these ends. In 1848 the first International Peace Congress was held under his guidance at Brussels. In 1865 he was consular agent at Birmingham, and in 1868 he returned to live on his farm in America. His best known writings are *Sparks from the Anvil*; *Thoughts and Things at Home and Abroad*, and *Chips from Many Blocks*.

Burroughs, *bur'roze,* John (1837–), an American naturalist and essayist, born in New York. He was the son of a farmer, and his youth was spent partly in farm work. After teaching for a time and holding various government positions, he withdrew to his New York farm, where he devoted himself to nature study, fruit culture and writing. His style is of the intimate and personal kind, easy and familiar, and as he has written most largely on nature subjects he has had a great influence toward a better appreciation of insect, bird and flower life. His works are remarkable not only for the accuracy of observation shown in them, but for the ability which he possesses to transfer to his readers his own interest in his subjects. *Locusts and Wild Honey, Pepacton, Wake Robin, Sharp Eyes, Far and Near* and *The Ways of Nature* are books of essays on rural subjects, while *Whitman: a Study, Literary Values* and *The Light of Day* are more literary. Many of his papers were written at *Slabsides,* the rustic house which he built for himself on his little celery farm, a mile or more from the Hudson River. In 1903 Burroughs traveled through the western United States with President Roosevelt.

Bur'rows, Julius Caesar (1837–), an American statesman, born in Erie County, Pa. He served in the Union army, 1862–1864, and after the war became prosecuting attorney of Kalamazoo County, Mich. He was a Republican member of Congress from 1873 to 1875, 1879 to 1883 and 1885 to 1895, and was elected United States senator in 1895, being reëlected in 1899 and 1905.

Bur'ton, Sir George (1819–1901), a Canadian jurist, born at Sandwich, Kent, England. He came to Canada in 1836, was admitted to the bar in 1842, was a member of the court of appeals from 1874 to 1897, and was then made chief justice of Ontario. He was chairman of the commission which consolidated the statutes of Ontario and was made a baronet in 1898.

Burton, John Hill (1809–1881), a Scotch historian. He early contributed to the *Westminster Review,* and afterward to the *Edinburgh and North British,* to *Blackwood's Magazine* and to the *Scotsman.* His first book was the *Life and Correspondence of David Hume,* followed by lives of Lord Lovat and Duncan Forbes of Culloden, and other works. His chief work is his *History of Scotland from Agricola's Invasion to the Revolution of 1688.*

Burton, Robert (1577–1640), an English clergyman and author. His vast out-of-the-way learning is curiously displayed in his *Anatomy of Melancholy,* which was published in 1621.

Burton-upon-Trent, a city of England situated on the Trent River and the Trent and Mercy canal, 11 mi. s. w. of Derby. It is celebrated for its malting and brewing industries and is the location of some of the largest breweries in the world. The town has a large number of churches, a girls' high school, a good system of public schools, a number of almshouses, an infirmary, public libraries and reading rooms. Population in 1901, 50,400.

Burying Bee'tle, the name of a genus of common insects that have a very keen sense of smell, which guides them to small dead animals, around and under which they burrow until the bodies are covered by the ground, sometimes to a depth of six inches. In these carcasses the beetles lay their eggs, and the young larvae, which hatch in less than a fortnight, find plenty of food awaiting them.

Bush′buck, a name given to several species of antelopes, but especially to a small species in South Africa, about four feet long and two and a half feet high, with triangular horns turned partially into a spiral. The male is dark brown with white below, and the female is reddish-brown above and white below. The *white-backed bushbuck* lives in Sierra Leone, and has black, shining, pointed and nearly straight horns, short, slender limbs and sleek, glossy, deep-brown hair.

Bush′el, a measure of capacity in the English system of weights and measures, used chiefly for measuring dry quantities. It contains 2150.42 cubic inches, being equal to a cylinder 8 inches deep and 18½ inches in diameter, interior measure. It is about equivalent to 35.24 liters. In Great Britain an *imperial bushel* is also used, having a capacity of 2218.192 cubic inches. A bushel is divided into 4 pecks, each peck into 8 quarts, each quart into 2 pints, each pint into 4 gills. It is also sometimes divided into 8 dry gallons.

Bushire, *boo sheer′.* See Abushehr.

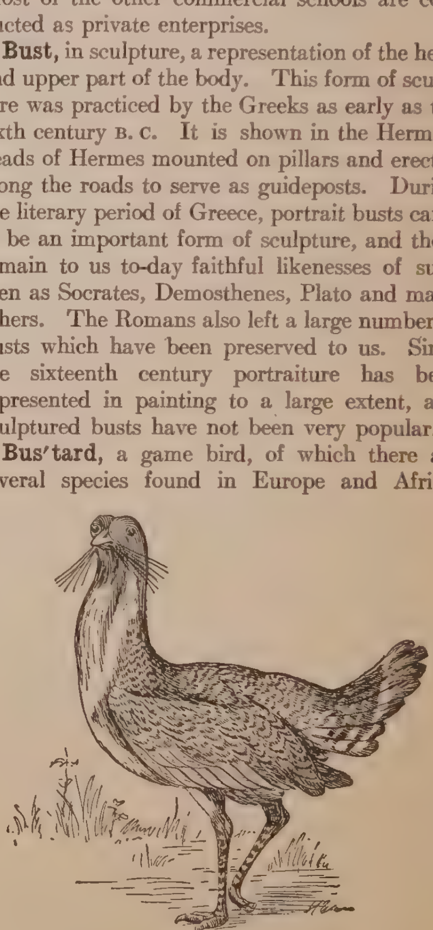
Bush′men, a race of people who dwell in the western part of South Africa, in the immense plains bordering on the north side of the Cape of Good Hope. They are among the most degraded races of the world. They unite only for defense or pillage, have no established homes and do not cultivate the land, but support themselves by hunting. Their language is exceedingly poor, consisting only of a certain clicking with the tongue and harsh, gurgling tones, for which we have no representation. They are now under the control of the British government.

Bushrangers, *boosh′rane jurz,* the name given in Australia to desperadoes or escaped convicts, who, formerly taking to the bush, supported themselves by levying contributions on the property of all within their reach.

Business, *biz′i nes,* **College,** a school devoted to training its pupils in different lines of commercial work. The business colleges in the United States are presumed to be the outgrowth of the work of Mr. R. M. Bartlett of Cincinnati, who in 1846 began to give instruction in bookkeeping and other commercial subjects to private pupils. By 1860 all leading cities of the country contained one or more business colleges, and since that time their number has greatly increased. For a number of years these schools possessed no special text-books, but as they increased in number and patronage special texts were provided. During the last quarter of the nineteenth century the development in all lines of industry made it necessary for the business colleges to extend their courses of study and provide instruction in a large number of branches. The courses of the best colleges now include instruction in commercial arithmetic, a thorough system of accounts, including banking and commission, shorthand and typewriting, commercial law and at least one modern language, usually German or Spanish. Many of the high schools of the country contain commercial departments, as do some of the best colleges. Most of the other commercial schools are conducted as private enterprises.

Bust, in sculpture, a representation of the head and upper part of the body. This form of sculpture was practiced by the Greeks as early as the sixth century B. C. It is shown in the Hermae, heads of Hermes mounted on pillars and erected along the roads to serve as guideposts. During the literary period of Greece, portrait busts came to be an important form of sculpture, and there remain to us to-day faithful likenesses of such men as Socrates, Demosthenes, Plato and many others. The Romans also left a large number of busts which have been preserved to us. Since the sixteenth century portraiture has been represented in painting to a large extent, and sculptured busts have not been very popular.

Bus′tard, a game bird, of which there are several species found in Europe and Africa. The head is flat, the neck thick and the bill somewhat blunt and depressed. This bird is now rare in Britain, but it is found in the southern



BUSTARD

and eastern parts of Europe and on the steppes of Tartary. The largest species weighs twenty-five or thirty pounds. Bustards can all run very rapidly, but they take flight with difficulty. Their food consists chiefly of juicy plants, though they eat earthworms and insects.

Butcher Bird. See SHRIKE.

But'ler, PA., the county-seat of Butler co., 31 mi. n. of Pittsburg, on the Conequenessing Creek and on the Baltimore & Ohio, the Pennsylvania and other railroads. The borough is near deposits of oil, natural gas, coal and iron, and it has very extensive glass factories. It also contains planing mills, steel car works, flour mills and manufactures of silk, white lead, tools and other articles. There is a well-equipped public library and a fine courthouse. The place was settled about 1798 and was incorporated in 1803. Population in 1910, 20,728.

Butler, BENJAMIN F. (1818–1893), an American lawyer, politician and general, born at Deerfield, N. H., and educated in Maine. He practiced law in Lowell, Mass., became prominent in his profession and was elected to the legislature, where he urged labor reforms. He was appointed brigadier general of the state militia at the outbreak of the Civil War, became major general of volunteers in May, 1861, and was given command of the Department of Eastern Virginia, where he made a failure of an important expedition. The following March he commanded an expedition sent to New Orleans, and from May to December commanded the city, arousing intense antagonism among the citizens by his arbitrary conduct. President Davis issued a proclamation declaring him to be an outlaw. In 1863 he was placed in command of Virginia and North Carolina, with the Army of the James. In an attempt to capture Richmond by operations from the south side of the James, he was checked by General Beauregard. Later he was sent to Fort Fisher, N. C., but he was removed from command by General Grant, and he returned to Massachusetts.

In 1866 he was elected to Congress as a Republican, and he served until 1879, with the exception of two years. He took an active part in the impeachment of President Johnson. In 1871 Butler was the unsuccessful Republican nominee for governor of Massachusetts, and in 1878 and 1879 he was again defeated for the same office, as the Greenback candidate; but in 1882 he was elected by the Democrats. In 1884 he ran as the Greenback-Labor candidate for president, but did not get any votes in the electoral college.

Butler, JOSEPH (1692–1752), an English prelate and writer on ethics and theology. His great work is *The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature*, which acquired for him a wide reputation.

Butler, NICHOLAS MURRAY (1862–), an American educator, born in Elizabeth, New Jersey. He was educated at Columbia College and after graduation took special courses in Berlin and Paris. Following his studies abroad, he was appointed assistant in philosophy in his *alma mater*. He founded and was the first president of the New York College for the Training of Teachers, which institution has since been incorporated into Columbia University. It was through his influence, while a member of the state board of education of New Jersey, that manual training was introduced into the public schools of that state. In 1902 he was elected president of Columbia University, to succeed Seth Low, who had been elected mayor of New York. He is the editor of *The Educational Review*, *The Teachers' Library*, the Great Educators series, the *Columbia University Contributions to Philosophy and Education* and *Monographs on Education in the United States*. He is also a frequent contributor to educational periodicals.

Butler, WILLIAM ALLEN (1825–1902), an American author and lawyer. Mr. Butler wrote in 1857 a society satire in verse, *Nothing to Wear*, and was thereafter a liberal contributor to the magazines.

Butler, WILLIAM ORLANDO (1791–1880), an American soldier and politician, born in Jessamine co., Ky. At the opening of the War of 1812 he joined a company of Kentucky volunteers and was present at the Battle of the River Raisin. During this engagement he was captured, and after being released he joined the southern American army, taking part in the famous Battle of New Orleans, January 8, 1815. He resigned from the army in 1817 and became a successful lawyer in Kentucky. He was elected to the state legislature and later served two terms in Congress. As Democratic candidate for governor of Kentucky in 1844, Butler reduced the usual Whig majority from 28,000 to 4000. He served in the Mexican War and was appointed major general of volunteers, being connected with both General Taylor's and General Scott's campaigns. On February 18, 1848, about a week before the signing of peace, he was appointed commanding general of the American army. In the same year he again retired from military service and was Democratic candidate for vice-president on the ticket with General Cass. He was a delegate to the peace conference of 1861 at Washington, but thereafter lived in retirement until his death.

Butte, *bute,* an isolated hill or mountain rising abruptly above the surrounding country. Buttes abound in the Rocky Mountain region; many of them have been formed by the erosion of ancient plateaus, and they are prominent features in the landscape. The term is also applied to high mountains, though it is not generally so used in the United States. See PLATEAU.

Butte, MONT., the county-seat of Silverbow co., 65 mi. s. w. of Helena, on the Northern Pacific, the Great Northern, the Union Pacific and the Milwaukee railroads. The city is in the midst of the largest copper mines in the world, and gold and silver mines are also near. The copper production is about half of the total for the entire United States. The city is distinctly a mining town and has immense mills and smelting works. The streets are paved and there is an excellent street railway system. The public schools are well equipped, a public library is maintained and the Montana School of Mines is located here. The city was settled in 1864 and was incorporated in 1879. The population of the city proper in 1910 was 39,165, but the immediate suburbs make a total of about 60,000.

But'ter, the fat of milk. Butter is now universally used as an article of food in the temperate regions. It was formerly made from the milk of goats and sheep, but it is now all made from the milk of the cow. Butter of good quality has a golden yellow color, is granular in texture and has a delicate flavor. In judging the quality, flavor is the most important item and usually counts about one-half. Butter is an excellent article of food, as it is the most nutritious fat that can be eaten. For this reason and because of its pleasant taste, it is highly prized, and if of a good quality it commands a high price on the market.

In England and some other countries butter is occasionally made by churning the new milk, but it is usually obtained by churning the cream. The first step in the process is separating the cream from the milk. This is done by setting the milk in a cool place in shallow dishes, by placing it in deep cans which are immersed in cold water, or by the cream separator. In the best dairies in the United States the separator has now replaced the other methods. It saves time and secures a larger proportion of the cream (See CREAM SEPARATOR). The cream may be churned while it is sweet or it may be allowed to stand until it becomes slightly sour, or ripens. The ripened cream is usually preferred, since it gives butter of a better flavor. While being churned the cream should be kept at a temperature of from 60° to 70°, and the time required should not exceed forty-five minutes. Churning simply gathers the particles of fat together and separates them from the buttermilk. After the churning, the buttermilk is drawn off, the butter is washed and then worked, for the purpose of expelling any remaining milk or water that it may contain, and for absorbing the necessary quantity of salt. The working is done either by hand or in a machine called the butter worker. In creameries churning and butter working are all done by machinery. In home dairies they are usually performed by hand labor. See CHURN.

Butter for shipment is made into prints, or bricks, or packed in firkins and shipped in bulk, according to the location of the dairy with reference to the market. Those creameries and dairies near large cities usually find it to their advantage to put the butter up in prints or bricks, while those situated at a long distance from market secure better results by shipping their product in bulk. The best butter in the United States is made in creameries, which control the market in all large cities. However, we find that only a little more than one-fourth of the entire product of the country is made in this way. Most of the remainder is made on farms and is used in homes or sold to grocers and other small dealers. Much of this is of poor quality and is sold by the country dealers to large creameries, which make a business of renovating it. Renovated butter is generally known as *process* butter, and the United States law requires that all butter so treated shall be marked *renovated.*

Denmark and Holland produce butter of the best quality, but the United States leads in quantity and produces about 1,500,000,000 pounds a year, the value of which is nearly $270,000,000. The leading butter states are Iowa, New York, Pennsylvania, Illinois and Wisconsin. In Iowa and Wisconsin the creameries produce more than the farms, but in the other states named the reverse is true. See CREAMERY; DAIRYING; MILK.

But′tercup or Crowfoot, a large genus of the crowfoot family, all of its species being annual plants, with stems bearing alternate leaves and usually bright yellow flowers, which appear singly or in clusters resembling a corymb. See Ranunculus.

But′terfield, Daniel (1831–1901), an American soldier, born in Utica, N. Y. He entered the Civil War as colonel of the Twelfth New York militia, and took an active part in the Peninsula Campaign. He commanded a corps at Fredericksburg and was chief of staff at Chancellorsville, Gettysburg, Lookout Mountain and Missionary Ridge. At the close of the war he had reached the rank of major general.

But′terfly, the common name given to a large class of insects having scaly wings and flying by day. Butterflies are the most beautiful of insects and by their brilliant colors and graceful flight attract universal attention. They differ from moths in the following particulars: 1. The antennae, or feelers, of butterflies are club-shaped, while those of moths are thread-like or feather-form. 2. When at rest butterflies hold their wings in a vertical position, while those of the moth remain flat. 3. Butterflies fly by day, while with few exceptions moths fly at twilight or during the night.

The body of the butterfly has three parts: head, thorax and abdomen. The conspicuous parts of the head are the two antennae, the eye clusters, or ocelli, and the tongue, which, when not in use, is coiled like the spring of a watch. Between the ocelli is a sucking apparatus, by means of which the insect draws its food up through the long tube constituting the tongue. The butterfly has six legs and four wings, all of which are attached to the thorax. The legs are weak and are used only when the insect is resting or feeding. The wings are large and strong; the first pair is usually triangular, the second pair, rounded. In some families, such as the swallowtails, the second pair of wings has long narrow or pointed extensions. The wings consist of membranes supported on a framework of tubes, which serve the double purpose of veins and air tubes. These tubes are double, one within the other. The air circulates through the outer and the blood through the inner. The membrane of the wings and the body of the butterfly are covered with minute scales, arranged like the scales on a fish or the shingles on a house. These scales, when viewed under a microscope, resemble feathers. They are highly colored and have a perfect structure. It is to them that the butterfly owes its brilliancy and beauty. When a butterfly is caught by the wings, the scales rub off like a fine dust. Their removal from the wings impairs the flight of the insect, or prevents it altogether.

Butterflies feed on the nectar of flowers. In most species, life in the perfect state lasts but a few days; as soon as the eggs for the next brood are deposited, the insect dies. The male and female of the same species usually differ in color, and frequently in size, and are often taken for different species.

Classification. Butterflies and moths constitute the insect order Lepidoptera, or scaly-winged insects (See Insects). The butterflies of North America are classed under the following families:

1. "Brush-footed" Butterflies (*Nymphalidae*).
2. "Metal Marks" (*Lemonidae*).
3. "Blues," "Coppers" and "Hair-streaks" (*Lycaenidae*).
4. "Swallowtails" (*Papilionidae*).
5. "Skippers" (*Hesperiidae*).

These five families include all the 650 or more species of butterflies found within the United States. About 50,000 species are known in the world.

The first and fourth of these families contain the most conspicuous and best known butterflies. Most of the specimens are large and characterized by brilliant coloring. The swallowtails and the diana are conspicuous species. A comparison of the species inhabiting tropical and semi-tropical climates with those of temperate latitudes shows that the former have more brilliant colors. The largest species of the tropics are the most gorgeous of insect creations. Their expanse of wing is often eight or more inches, and their coloring is more brilliant than that of the richest tropical flowers.

The habitats of the other species, common in the Southern states, are as follows: The *White Skirted Calico* is a native of Texas; the *Cloudless Sulphur* is common from New England and the Great Lakes to the extreme southern points of South America; the *Great Purple Hair-streak* is common in Central America, Mexico and the Gulf States, and the *Mimic* is a native of Florida and the West Indies.

Life History. Butterflies undergo a complete transformation, or metamorphosis; to complete their life histories they live in four forms: the egg; the larva, or caterpillar; the pupa, or chrysalis, and the imago, or perfect insect.

The eggs are deposited either singly or in clusters on or near the plant upon which the larva feeds. Each fertilized egg contains the germ of the larva and a fluid upon which this germ is nourished during the period of incubation. This period varies with the species, the locality and the season. In warm countries, and during the summer months, in temperate latitudes, the period of incubation does not usually exceed three weeks, while it may be less. But in cold climates the period is much longer, and in temperate climates the eggs deposited in the fall do not hatch until spring.

The larva, or caterpillar, is the second stage in the development of the butterfly. The work of the caterpillar is to eat and grow, and it applies itself industriously to its task (See CATERPILLAR). The duration of the larva stage varies with the locality, the season and the species. In temperate climates the larva stage lasts from three to four months, while in the cold regions, where the winters are severe, the period is often ten months. When the second stage is completed, the caterpillar is transformed into a pupa or chrysalis. While the caterpillars of moths generally spin cocoons of silk in which the pupa is enclosed, those of butterflies form a chrysalis having a hard, smooth outer case. The caterpillars of many species attach themselves by buttons of silk to the under side of leaves and change into naked chrysalides hanging head downward. In other species the chrysalis is attached at one end and also suspended by a silk cord attached to the branch a little more than half the distance between the first point of suspension and the other end of the chrysalis. Chrysalides thus suspended usually take a nearly horizontal position. With few exceptions chrysalides are of a dull color, resembling the object to which they are attached. In the pupa state the insect is to all appearances lifeless, yet it breathes through small pores, and the mysterious life processes of transformation are slowly operative. Many butterflies remain in the chrysalis only a few weeks, while some continue through the winter, or, in tropical climates, during the dry season, before the transformation is completed. When the imago, or perfect insect, emerges from the chrysalis, it retains some resemblances to the caterpillar, but in from two to four hours its form becomes perfect and it is ready for flight.

Butterfly Weed or **Pleurisy Root,** a plant common in the United States and in southern Canada. The root, which is sharp and bitter when fresh, but merely bitter when dry, is useful as a medicine. The plant, which belongs to the milkweed family, has a strong, branching stem about eighteen inches high, that bears large bunches of orange-yellow flowers.

Butterine, *but'tur in,* an artificial butter, prepared from beef suet, lard, milk, butter and vegetable oil. By the use of coloring matters it can be made to resemble butter of any given brand; but although wholesome when well made, it has not the delicate flavor and aroma of the highest class butters. See OLEOMARGARINE.

But'ternut, the fruit of the white walnut, so called from the oil it contains. The tree bears a resemblance in its general appearance to the black walnut, but the wood is light in color.

But'ter-tree, a name of several trees which yield oily or fatty substances resembling butter.

But'terwort, a plant growing in bogs or soft grounds. The leaves are covered with soft, pellucid hairs, which secrete a liquor that catches small insects. The edges of the leaf roll over on the insect, which dies and serves as food for the plant. In the north of Sweden the leaves are employed to curdle milk.

BUTTERWORT

But'terworth, BENJAMIN (1837–1898), an American statesman. He was educated at Ohio University and was admitted to the bar in 1861. He practiced law in Cincinnati, and in 1870 became United States district attorney and afterwards state senator. He was elected to Congress five times, his first term beginning in 1878. Mr. Butterworth was a Republican, introduced the compulsory army retirement act in Congress and was appointed commissioner of patents in 1883 and commissioner of pensions in 1897.

But'terworth, HEZEKIAH (1839–1905), an American editor and writer for young people. He had only a common school education, but he supplemented it by extensive travels in the United States and abroad. In 1870 he became an editor of *The Youth's Companion* in Boston, a position he held till 1894. He is the author of *Zig-zag Journeys, In the Boyhood of Lincoln, The Patriot Schoolmaster* and many other juvenile works, besides several volumes of poems and essays. As a platform lecturer on literary subjects, travel and child training, he achieved some fame.

But'tons, articles used for fastening together wearing apparel or for ornaments. Buttons are made of paper, glass, pearl, shell, horn, ivory, vegetable ivory, wood and iron. According to their pattern, buttons are divided into three general classes: *hole* buttons, *shank* buttons and *covered* buttons. Hole buttons have holes drilled in the center, through which they are sewed onto the cloth. Shank buttons contain a loop of wire, generally known as the *eye*, by means of which the button is attached. Covered buttons consist of wooden or iron molds covered with cloth.

The manufacture of buttons became an important industry in England during the reign of Queen Elizabeth, and Birmingham was then, as now, its chief center. Metal buttons were manufactured in the United States at Philadelphia as early as 1750, and in 1800 a button factory was established at Waterbury, Conn., which town is now the center of metal button manufacture in America. The most important branch of the button industry in the United States, however, is the making of pearl buttons, of the shells of a species of fresh-water mussel found in large numbers in the Mississippi River. This industry began in Iowa, and factories are now found along the river from Red Wing, Minn., to Louisiana. The process of making these buttons is very simple. The shell is soaked until it is soft; it is then cut by tubular saws into circular pieces the size of the button. The holes are then drilled in these, and the buttons are polished and finished. Owing to the brittleness of the shell, nearly all of the work has to be done by hand.

There are many styles of buttons. Aside from the pearl buttons, those in most common use are made from vegetable ivory, which is susceptible of taking any color, from gutta-percha and from celluloid. Expensive metal buttons are used for special purposes, and a modern feature of the button industry consists in the manufacture of buttons to be worn as symbols of membership in some organization. Some of these, such as that used by the Grand Army of the Republic, are beautiful works of art and are made of bronze, gold or silver. Others, made of celluloid, contain mottoes, symbols or photographs.

But'tress, in architecture, a projection on the outside of the walls of an edifice, intended to give additional support to the walls. It originated among the Byzantines, but attained its highest and most beautiful form in the Gothic architecture, where it came to be used wholly as an ornament. *Flying buttresses*, of a somewhat arched form, often spring from the top of the ordinary buttresses, leaning inward so as to abut against and support a higher portion of the building, thus receiving part of the pressure from the weight of the roof of the central pile.

Butyr'ic Acid, an acid obtained from butter and found also in perspiration, cod-liver oil and other substances. Butyric acid is a colorless liquid, having a smell like that of rancid butter; its taste is at first burning and biting, with a sweetish after-taste.

Buz'zard, a hawk of a genus that is common both in Europe and the United States, though in the United States the name is more commonly applied to the turkey buzzard. The common buzzard of Europe is distributed over the whole of that grand division, as well as over the north of Africa. It feeds upon mice, frogs, toads, worms and insects, and is very sluggish in its habits. See HAWK; TURKEY BUZZARD.

Buzzard's Bay, a bay on the south coast of Massachusetts. It is 30 mi. long and from 5 to 10 mi. wide. The Elizabeth Islands separate it from Vineyard Sound. It contains the harbors of New Bedford, Wareham, Sippican, Nasketucket and Mattapoiset. Buzzard's Bay is a popular summer resort.

By'-law, a law made by an incorporated or other body, for the regulation of its own affairs or of the affairs entrusted to its care. Town councils, railway companies and other bodies enact by-laws, which are binding upon all coming within the sphere of their operations. By-laws must of course be within the meaning of the charter of incorporation and in accordance with any higher law which binds the body or its members.

By'ron, GEORGE NOEL GORDON, Sixth Lord (1788–1824), a great English poet. Till the age of seven he was entirely under the care of his mother, and to her injudicious indulgence the waywardness that marked his after career has been partly attributed. On reaching his seventh year he was sent to the grammar school at Aberdeen, and four years after, in 1798, the death of his grand-uncle gave him the titles and estates of the family. Mother and son then removed to Newstead Abbey, the family seat, near Nottingham. Soon afterwards Byron was sent to Harrow, where he distinguished himself by his love of manly sports and his unsystematic reading, rather than by careful study. In 1805 he was entered at Trinity College, Cambridge. Two years later appeared his first poetic volume, *Hours of Idleness*, which, though containing nothing of much merit, was criticised with unnecessary severity by Brougham in the *Edinburgh Review*. This criticism roused Byron and drew from him his first really notable effort, the celebrated satire, *English Bards and Scotch Reviewers*.

In 1809, in company with a friend, Byron visited the southern provinces of Spain and voyaged along the shores of the Mediterranean. The fruit of these travels was *Childe Harold's Pilgrimage*, the first two cantos of which were published on his return in 1812. The poem was immediately successful and Byron "awoke one morning and found himself famous." During the next two years *The Giaour*, *The Bride of Abydos*, *The Corsair* and *Lara* appeared, and Byron's literary reputation grew steadily. During these years, however, he was living in the most reckless dissipation. In 1815 he married the daughter of Sir Ralph Milbanke; but the marriage turned out unfortunately, and in about a year Lady Byron left him for her father's house and refused to return. This rupture gave rise to much popular indignation against Byron, who left England, with an expressed resolution never to return. He visited France, the field of Waterloo and Brussels, the Rhine, Switzerland and the north of Italy; for some time lived at Venice, and latterly at Rome, where he completed his third canto of *Childe Harold*. Not long after appeared *The Prisoner of Chillon*, *The Dream, and Other Poems*; and in 1817 *Manfred*, a tragedy, and *The Lament of Tasso*. From Italy Byron made occasional excursions to the islands of Greece, and at length he visited Athens, where he sketched many of the scenes of the fourth and last canto of *Childe Harold*. Between 1817 and 1822 appeared, among other poems, five cantos of *Don Juan* and a number of dramas. While living at Pisa he enjoyed for a time the companionship of Shelley, one of the few men whom he entirely respected and with whom he was quite confidential. Besides his contributions to the *Liberal*, a periodical established at this time in conjunction with Leigh Hunt and Shelley, he completed the later cantos of *Don Juan*, with *Werner*, a tragedy, and *The Deformed Transformed*, a fragment. These are the last of Byron's poetical works. In 1823, troubled perhaps by the consciousness that his life had too long been unworthy of him, he threw himself into the struggle for the independence of Greece. In January, 1824, he arrived at Missolonghi, where he was received with the greatest enthusiasm. The malarious air of Missolonghi began to affect his health, and on April 9, 1824, while riding in the rain, he caught a fever, which ten days later ended fatally. Byron's natural force and genius were perhaps superior to those of any other Englishman of his time, and won for him in his own day a fame second to none of his contemporaries. After his death his work was for some time as far underrated as it had been overrated during his life, and it is only within the last few decades that a calm judgment has been passed on his writings.

LORD BYRON

Byzantine, *be zan′tin*, **Art**, a style which arose in southeastern Europe after Constantine the Great had made Byzantium the capital of the Roman Empire (330 A. D.), and ornamented that city with all the treasures of Grecian art. To a certain extent Byzantine art may be recognized as the endeavor to give expression to the new elements which Christianity had brought into the life of men. The tendency toward Oriental luxuriance and splendor of ornament quite supplanted the simplicity of ancient taste. Richness of material and decoration was the aim of the artist, rather than purity of conception. The style made use of Roman constructive principles, Oriental ornamentation and color, and Greek freedom and use of detail.

With regard to the *sculpture*, the statues no longer displayed the freedom and dignity of ancient art. The true proportion of parts, the correctness of the outlines and, in general, the severe beauty of the naked figure or of simple drapery, exemplified in Greek art, were neglected for extravagant costume and ornamentation and petty details. From the sixth to the eleventh century, which was the best period of Byzantine art, figures were produced which possessed considerable beauty and preserved a dignity that was really difficult to obtain with such artificial forms as were created. The artists, who employed no models, naturally departed from nature, and their work is showy rather than beautiful. The figures, with their brilliant costumes, may be readily recognized after they have once been pointed out. One of the favorite branches of the art was mosaic work, and in this the artists succeeded in obtaining a brilliant effect with costly stones. See ARCHITECTURE, subhead *Byzantine Architecture*.

Byzantine Empire, also called the Eastern, Greek, or Later Roman Empire. The existence of the Byzantine Empire as a separate dynasty lasted nearly 1000 years, from the death of Theodosius the Great, 395 A. D., to the fall of Constantinople, 1453. Theodosius the Great before his death divided his dominions between his two sons, Honorius and Arcadius, and the latter became the first of the Byzantine emperors (See THEODOSIUS). He was a weak ruler, who made few attempts to hold the power in his Empire, but let it be exercised by his ministers.

During the reign of Theodosius II (408–450) the regency was secured by his sister Pulcheria, and was retained even after he reached his majority. She gave the Empire an able administration, carrying on a successful war against the Persians and recovering for Valentinian III the Western Empire, in return for which service the Byzantine territory received cessions to the westward. The ravages of Attila and the Huns in Thrace and Macedonia were averted only by the payment of annual tribute. On the death of Theodosius, Pulcheria was called to the throne, and she was the first woman to enjoy this dignity. She married Marcianus, whose successful reign continued four years after the death of his wife. Leo I, a hitherto almost unknown Thracian, succeeded, and he was himself succeeded in 474 by Zeno the Isaurian (474–491). Zeno was driven from his capital by Basilicus, but regained the throne. His Empire was threatened by Theodoric and the Goths, but the peril was averted by large presents, and the invaders were induced to march westward to Italy. During Zeno's reign occurred the disastrous fire at Constantinople, by which the library, with more than 100,000 manuscripts, was destroyed. Anastasius (491–518) built the famous "long walls" across the peninsula, to protect Constantinople from the inroads of the Bulgarians.

Justin I (518–527) was succeeded by his nephew, the famous Justinian I (527–565), under whom the Byzantine Empire enjoyed the most glorious period of its existence (See JUSTINIAN I; BELISARIUS).

His unfortunate successor, Justin II (565–578) was harassed on one frontier by the Persians, on the other by the terrible Avars. Most of Italy was lost to the Lombards. The reign of Heraclius (610–641) presents a series of overwhelming reverses retrieved by glorious victories. The Persians took Syria, Palestine and Asia Minor, and the invading hordes advanced to a point within sight of Constantinople. Shrewdly gaining time by a humiliating treaty, Heraclius collected his forces and inflicted a defeat upon the Persians at Issus.

The Moslem hordes of Arabs under Mohammed and his successors appeared next. Between 635 and 641 Syria, Judea and all the African possessions were lost. What remained, however, was more closely united than before, and from this time the Empire became distinctly Greek in character. The dynasty of Heraclius ended with Justinian II, who was assassinated in 711. The eighth and ninth centuries witnessed a peculiar internal religious controversy, which greatly weakened the defense of the Byzantines against their foreign foes. This was the war of the Iconoclasts, most violent under Leo III, the Isaurian (717–741), himself an ardent Iconoclast (See ICONOCLASTS). Leo's successor, Constantine V (741–775), was also a zealous Iconoclast and closed many monasteries and convents. Image-worship was restored for a brief period by the Empress Irene, who had obtained the throne by blinding her own son, Constantine VI, for whom she was guardian (797). She was ambitious to marry Charlemagne and thus to reunite the Eastern and Western empires, but her plan was not supported. During the reign of Leo V (813–820), the Bulgarians overran Thrace and laid siege to Constantinople, but they were finally repulsed. The Saracens captured Crete and Sicily (824–827). Under Michael III (842–867), who reigned first under the guardianship of his mother, Theodora, the images were finally restored in the Greek Church. It is at this time that the Russians first appear as enemies of the Empire.

The Macedonian dynasty (867–1057) was founded by Basil I, during whose reign the Saracens conquered Sicily and ravaged the Peloponnesus. His son, Leo II (886–912), called in the Turks to aid against the Saracens, and thus the former paved the way for future conquests. Under Basil II the Bulgarian kingdom was overthrown, and that country became a Greek province (1018), remaining so until 1186. About the middle of the eleventh century the Seljuk Turks became threatening, and in Italy the Byzantine possessions were nearly all seized by the Normans. Isaac, the first of the Comneni, reigned from 1057 to 1059. Under his successors the inroads of the Seljuks became more frequent, and by 1078 they had conquered nearly all of Asia Minor.

The steady advance of the Mohammedan power alarmed all Christian Europe, and during the reign of Alexius Comnenus (1081–1118), began the wonderful movement of allied Christendom known as the Crusades (See CRUSADES). As the hosts marched toward Asia Minor *via* Constantinople, the movement could not but have an important influence on the fortunes of the Byzantine Empire. Alexis wanted help against the Turks, but the vast numbers that came alarmed him, and their depredations within his territory led to serious conflicts, and finally, under later emperors, to open hostility. In 1204 Constantinople was taken by the Crusaders, who established the Latin Empire (1204–1261), with Count Baldwin of Flanders as first emperor. This Latin Empire was never strong, and in 1261 the emperor of Nicaea, Michael Palaeologus, captured Constantinople and reëstablished the Greek Empire.

Michael (1261–1282) founded the dynasty of the Palaeologi, which lasted until 1453. He made fruitless efforts to reunite the Greek and the Latin churches. His son, Andronicus II (1282–1328), attempted to repel the Turks, but in the following reign they took Nicaea and Nicomedia. In 1361 the Sultan Amurath took Adrianople, and he afterward conquered Macedonia and part of Albania, whereupon the emperor, John (1341–1391), acknowledged himself Amurath's vassal and agreed to pay tribute. The Turks attacked Constantinople in April, 1453, with an army of 400,000 men, under Sultan Mohammed II. The garrison held out until May 29, when the city was finally taken, Constantine, the last of the Byzantine emperors, falling in the thick of the fight. The various principalities and islands were conquered by 1461, and the last vestige of the Byzantine Empire had disappeared. But it had not existed in vain; for all through the Dark Ages, when the Roman civilization of Western Europe had succumbed to the barbarians, the precious legacy of the ancients was guarded and preserved for the modern world. And, furthermore, the Byzantine Empire stood as a bulwark against the barbaric hordes of Asia until the growing nations gathered strength to withstand their onsets. When we realize that without it all that was best in the world's past would have been lost, all that is best in modern civilization retarded for hundreds of years, then only is the true significance of the Byzantine Empire understood.

Byzantium, *be zan'she um,* the original name of the city of Constantinople. See CONSTANTINOPLE.

C

C, the third letter in the English alphabet and in all other alphabets derived from the Latin. It occupies the same place as the Greek *gamma*, and it originally had a similar sound, that of hard *g*. In English, *c* now represents two perfectly distinct sounds, namely, the guttural sound belonging to *k* and the sharp or thin sound of *s*; while it also forms with *h* the digraph *ch*. It may be said, in general, that *c* has the *k* sound before the vowels *a*, *o* and *u*, the *s* sound before *e*, *i* and *y*. The digraph *ch* has three different sounds, as in *church*, *chaise* and *chord*.

In music, *C* is the first or key note of the diatonic scale of *C* major. When placed after the clef sign, *C* is the mark of common, or $\frac{4}{4}$ time. As an abbreviation, *C* stands for one hundred and for Centigrade; *c* stands for cent.

Caaba, *kah'ba*. See Kaaba.

Cab, the name given to a carriage that is licensed for public service. In England the cab is called the hackney coach, and that name is sometimes applied to it in this country. It is a closed carriage, with an outer seat for the driver, and may carry two or four persons. Cabs are in very general use in all large cities.

Cabal', the name given to a group of men who are banded together for the promotion of their own interests, especially political interests. The name is said to be derived from the initial letters of the names of the cabinet of Charles II—Clifford, Ashley, Buckingham, Arlington and Lauderdale. See Conway Cabal.

Caballero, *kah'bah lya'ro*, Fernan (1797–1877), the pseudonym of Cecilia Böhl von Faber, the chief modern Spanish novelist. Her first novel, *The Sea-Gull*, appeared in 1849, and was followed by *Elia*, *Air-Built Castles* and *The Bird of Truth*, as well as by many shorter stories. The chief charm of her writings lies in her descriptions of life and nature in Andalusia.

Cabatuan, *kah ba twahn'*, a city of Panay, Philippine Islands, situated on the Tigum River, in the province of Iloilo. It is connected by roads with the important towns of the island and has a good trade. It was founded in 1732. Population, 16,497.

Cab'bage, a plant of the mustard family, cultivated for its edible leaves, which in the common varieties are crowded together in dense heads. The wild cabbage is a native of the coasts of Britain, but it is much more common on other European shores. The kinds most cultivated are the common cabbage, the savoy, the broccoli and the cauliflower. The common cabbage forms its leaves into heads or bolls, the inner leaves being nearly white. Its varieties are the white, the red or purple, the tree or cow cabbage, for cattle, and the very delicate Portugal cabbage. The garden sorts form valuable culinary vegetables and are used at table in various ways. In Germany pickled cabbage forms a sort of national dish, known as *sauerkraut*. The cow cabbage of the Channel Islands attains gigantic proportions for a vegetable, and the stalks, which frequently grow to heights of twelve or sixteen feet, are used as rails for fences and as rafters for the thatched roofs of farm buildings, while shorter ones are made into umbrella handles and walking sticks, which are much in demand as curiosities among tourists. In the United States raising cabbages on truck farms near large cities constitutes an important industry.

Cabbage Palm, a name given to various species of palm trees, because the terminal bud, which is of great size, is edible and resembles a cabbage. It is a species of the areca palm (See Areca).

Cabbage Rose, a species of rose of many varieties, supposed to have been cultivated from ancient times, and eminently fitted, because of its fragrance, for the manufacture of rose water and attar. The name Provence rose is sometimes given this species.

Cab'inet, the collective body of ministers who direct the government of a country. In the United States the cabinet is not formally recognized or named in the Constitution; but the name is given to the heads of administrative departments, considered as a collective body.

It consists of the secretary of state, the secretary of the treasury, the secretary of war, the attorney general, the postmaster general, the secretary of the navy, the secretary of the interior, the secretary of agriculture and the secretary of commerce and labor. These officers act as an advisory board to the president. They are appointed to office by the president, but their appointments must be confirmed by the Senate, and they hold office until their successors are appointed and confirmed. Contrary to the English system, the United States cabinet members do not have seats in Congress; there is not premier, and the president, not the cabinet, is responsible for the acts of the government. The salary of members of the cabinet is $8,000 a year.

In England, though the executive government is vested nominally in the crown, it resides practically in a committee of ministers called the *cabinet.* Every cabinet includes the first lord of the treasury, who is usually (not always) the prime minister or chief of the ministry and, therefore, of the cabinet; the lord chancellor; the lord president of the council; the chancellor of the exchequer; the first lord of the admiralty, and the five secretaries of state. Although the cabinet is regarded as an essential part of the institutions of Great Britain, it has never been recognized by act of Parliament. It began to take its present form in the reign of William III.

Ca'ble, Atlantic, the name popularly applied to the first submarine telegraph connecting America and Europe. It extended from Heart's Content, Newfoundland, to Valentia Bay, Ireland, and was 2500 miles long. In 1854 the Atlantic Telegraph Company was organized through the efforts of Cyrus W. Field of New York, who secured the coöperation of English and American capitalists. The cable constructed by this company was of the pattern in general use at the present time (See Cable, Submarine).

The first cable was completed and loaded on two ships, which were loaned respectively by the governments of Great Britain and the United States. The first of these vessels, the *Niagara,* began laying the cable from Valentia, August 6, 1857, but when several hundred miles had been paid out, the cable broke and the vessels were compelled to return to Plymouth, where the cable was stored until the following year, during which time enough new cable was made to supply the loss sustained by the break. At a second attempt the ships sailed to a point midway between the terminals, joined the cable together and proceeded in opposite directions. This cable was successfully laid, on August 17, 1858, connections with the transmitting and receiving instruments were completed, and congratulatory messages passed between the president of the United States and the queen of Great Britain; but after a short time the cable ceased to work.

Notwithstanding all of the difficulties which he had encountered, Mr. Field continued to arouse interest in his enterprise. A third cable was constructed and loaded upon the *Great Eastern,* at that time the largest steamship that had ever been constructed. The laying of this cable began in August, 1865, but after a thousand miles had been paid out the cable broke, and the lost end could not be recovered. This necessitated the making of a new cable, which was successfully laid the following year and has continued to work, with few interruptions, since. The Atlantic cable has been followed by a number of others, so that telegraph communication between the United States and European countries is now ample. See Field, Cyrus W.; Telegraph.

Cable, Electric, a wire or an arrangement of wires for carrying an electric current. Originally electric cables were designed to convey electricity under water or under ground, but since the employment of electricity for power, they are in general use for carrying the main current from the place where it is generated to points where it is needed for use. (For the construction of cables for carrying the current under water, see Cable, Submarine.) The ordinary electric cable consists of one or more copper wires enclosed in some non-conducting substance and protected from the moisture in the atmosphere. The entire structure is frequently enclosed in a thin coating of rubber. The cable is suspended upon poles, being attached to glass or porcelain insulators in about the same manner as telegraph or telephone wires. By means of this arrangement an electric current can be carried at least two hundred miles from the place where it is generated and still retain sufficient force to operate machinery and electric cars.

Cable, George Washington (1844–), a popular American author, born in New Orleans. At the outbreak of the Civil War he entered the Confederate army and served until the close of the war. While serving as accountant for a cotton firm he wrote various papers for periodicals, and his early success encouraged him to devote himself entirely to literature. His sketches of Creole life revealed to the world an interesting phase of American social life hitherto almost unrecognized, and his keen observation and dexterous use of the Creole dialect at once found him a public on both sides of the Atlantic. Among his books are *Old Creole Days*; *The Grandissimes*; *Madame Delphine*; *Dr. Sevier*; *The Creoles of Louisiana*; *The Silent South*; *Bonaventure*; *Strange, True Stories of Louisiana*; *John March, Southerner*, and *The Cavalier*. Cable has also lectured with success on his chosen subject.

GEORGE WASHINGTON CABLE

Cable, Submarine, a cable laid on an ocean or river bed, for the purpose of carrying telegraph messages under water. A submarine cable consists of a core of copper wire made by twisting together from three to six wires, in an insulating case of gutta-percha, around which jute yarn is wound; a protecting case of wire rope, which in turn is wound with jute yarn saturated with pitch or some other bituminous compound to protect it from the water. The size of the cable varies according to the stress which it must withstand. It is largest near the shore, where the wear is greatest and where it is subject to danger from anchors. In the deep sea the standard size is a little less than an inch in diameter. Cables are laid on the bottom of the body of water which they traverse, and they are anchored where they land, but otherwise they are not fastened. The ends are connected with transmitting and receiving apparatus constructed especially for this sort of telegraph and differing considerably from the ordinary telegraph instruments (See Telegraph). The resistance to the electric current is much greater in the cable than in the ordinary telegraph line; consequently the receiving instruments need to be proportionately more delicate. The receiver in most general use consists of an apparatus containing a glass tube in the form of a siphon, one end of which dips into an ink reservoir while the other is drawn to a very fine tip which rests just above the surface of a paper tape that is caused to move uniformly over a table. When in action, the electric current swings the point of the pen to the right and left, and at the same time causes the ink to flow on the ribbon in minute drops, forming a wavy line, a part of which is above and a part below a line drawn lengthwise through the middle of the tape. The portions of the line on the upper half of the tape are read as dots, and those in the lower half as dashes. By use of this device the message is read in the Morse alphabet.

The early cables were short, and connected places only a few miles from each other. The first successful attempt to telegraph under water was made by Prof. S. F. B. Morse, in 1842. He laid a copper wire, insulated by a covering of hemp, pitch, tar and rubber, from Governor's Island to the Battery, in New York City, and was enabled to send and receive signals over it. The wire was soon caught by the anchor of a ship and broken, but the experiment was sufficiently successful to warrant the conclusion that cables of greater length could be made to work successfully. Ten years later a cable 75 miles long was laid between Dover and Ostend, and this also worked successfully. A little later a number of short cables were laid by European governments. In 1854 a company was organized for the purpose of laying a submarine cable from Newfoundland to Ireland, a distance of 2000 miles. The Atlantic Telegraph Company was organized the same year and for a similar purpose. This company constructed and laid the first Atlantic cable, which was completed in 1858 (See Cable, Atlantic). The final success of the Atlantic cable demonstrated the feasibility of submarine telegraphy, and since 1866 the number of submarine cables has constantly increased, until now there is scarcely a habitable part of the globe that does not have telegraph communication with all the world. In 1905 the ocean cables aggregated more than 225,000 miles. Of this number 29,300 miles were owned by governments and 193,500 miles by private corporations. Most of the government lines are short, while the long lines are owned by private companies. See Cables, Pacific.

Cables, Pacific, the name of two submarine cables connecting North America with Australia and the countries of the Far East. The *American cable* was constructed and laid by the Pacific Commercial Cable Company; it extends from San Francisco to Manila, Philippine Islands, by way of Honolulu, the Midway Islands and Guam. Its entire length is 7613 miles. The average depth of the ocean bed over which it is laid is three miles. The construction and laying of the cable were completed within eighteen months of the organization of the company, and its completion on July 4, 1903, placed the United States in direct communication with all of its island possessions in the Pacific without the use of foreign lines.

The *British cable* connects British Columbia with Australia, and it was constructed conjointly by the governments of Great Britain, Canada, New Zealand and Australia. It extends from Vancouver, British Columbia, to Palmyra, in the Fiji Islands, thence to the Norfolk Islands, from which branches extend to New Zealand and Queensland, Australia. Its entire length is 7986 miles. It was completed in 1902, and it places the British possessions of the Pacific Ocean in direct communication with the United States and Canada. See Cable, Submarine.

Cab′ot, George (1751–1823), an American statesman, born in Salem, Mass. He studied for a time at Harvard College, but left school to go to sea, becoming a captain before he was of age. He was chosen to the Massachusetts provincial congress in 1775 and was a member of the state convention which adopted the Federal Constitution. In 1791 he was chosen United States senator and was made secretary of the navy when that department was organized in 1798. He served but a month, however. He was a leading Federalist and was chosen president of the celebrated Hartford Convention in 1814.

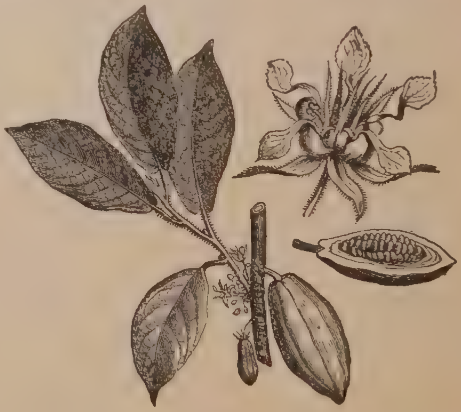
Cabot, John (1450–1498), an Italian navigator and explorer, born at Genoa. He removed to Venice, engaged in trade and later went to Bristol, England, where he was appointed to high offices. In 1496 King Henry VII issued to him letters patent, authorizing him to take possession of any lands which he discovered in the western seas. He sailed in the following May, skirted the coast of Labrador and returned to England, where he was made lord admiral. He prepared for a second voyage for the purpose of colonizing the lands which he had found, and set sail in the spring of 1498. All but one of the vessels were probably destroyed by storm. The exact extent of Cabot's discoveries is not known, but the stories of a voyage along the whole Atlantic coast of America probably refer to one undertaken by Sebastian Cabot, son of John Cabot.

Cabot, Sebastian (1474–1557), a noted navigator. He was the son of John Cabot, but little is known of his early life. There is a tradition that he accompanied his father upon the latter's expedition in 1497, and that they made another voyage in 1498, but there is little evidence upon that point. In 1517 he probably made an attempt to discover the northwest passage, visiting Hudson Bay, and in 1526, when in the Spanish service, he visited Brazil and the La Plata River. In 1548 he again settled in England and received a pension from Edward VI.

Cabral, *ka brahl′*, Pedro Alvarez (1460–1526), a Portuguese navigator and explorer famous chiefly for one voyage, made during the winter of 1500–1501. He set out for the East Indies by way of the Cape of Good Hope, but was driven west by adverse winds and the equatorial current and touched Brazil, of which he took possession in the name of the king of Portugal. He then started out again for India and made the first commercial treaty of Portugal with the natives of the East.

Cabul, *ka bool′*. See Kabŭl.

Cacao, *ka ka′o*, or **Cocoa,** *ko′ko*, a tree about sixteen or eighteen feet high, from which cocoa and chocolate are prepared. It is a native of tropical America, but it is widely cultivated in the tropics of both hemispheres for its fruit, which consists of pointed, oval, ribbed pods, six to ten inches long, each enclosing from fifty to one hundred seeds in a white, sweetish pulp.



CACAO

The seeds, which contain about fifty per cent of fat, are pleasant to the taste and are used, both fresh and dry, as an article of diet. *Cocoa* is the name given to the ground seeds after the oil has been extracted. When prepared for sale it is often mixed with other substances (See CHOCOLATE). If the cocoa is wanted for drinking purposes, it is ground to a flour-like powder and packed in tin boxes. If prepared for eating, or for the confectioners, several varieties are mixed, carefully blended and flavored with various substances upon which depend the quality of the cocoa. *Cocoa butter* is a common name given to the oil which is prepared from the bean and is much used by confectioners in making candy. When the butter is used for table purposes, a little half-churned cream or butter color is put in. When left white, cocoa butter is almost tasteless and odorless, and it is often used in the kitchen in place of cheap butter or lard. The cocoanut is the fruit of a very different plant.

Cachalot, *kash′a lot.* See SPERM WHALE.

Cac′tus, a genus of peculiar plants which grow in dry, warm climates. The cacti generally are shrubs having juicy stems, which are covered with minute, scale-like leaves and clusters of sharp spines. In one species only are the leaves at all large. The fleshy stems assume many extraordinary forms, from the branching, tree-like cactus to the globe-shaped varieties, both of which are found in the southwestern United States, where the plants grow in abundance. Although the plant has been introduced and become naturalized in many parts of the Old World, yet all, with the exception of one species, are natives of America. Of some species the fruits are edible, and many furnish large and exceedingly beautiful flowers. It is a cactus plant upon which the cochineal insect lives. See COCHINEAL; CEREUS; PRICKLY PEAR.

MELON CACTUS

Cad′dice Fly or **May Fly,** a little insect which looks much like a moth. Its eggs are laid in the water, attached to some plant, and when they hatch, the larvae, which have strong heads and jaws but very delicate bodies, form over the latter a firm case of mud, stones, grass or roots and live under the water until they are ready to emerge from the pupa state. In some species the cases are spiral, like snail shells. The caddis worms are hungry insects and destroy large quantities of fish spawn.

Cad′doan Indians, a group of indian tribes now nearly extinct. Formerly they lived in the country from the Brazos River as far east as Louisiana, and consisted of about a dozen agricultural tribes.

Cade, *kade,* JOHN (better known as Jack Cade) (?–1450), a popular agitator in England, the leader of an insurrection which broke out in 1450. Yeomen and tradesmen formed the bulk of the insurgents. The rebellion was political, not social like that headed by Wat Tyler, and it aimed to bring about the correction of numerous abuses. Cade defeated a detachment of troops sent against him and even ruled London for two days, causing one of the king's favorites, Lord Say, to be beheaded. A promise of pardon caused his followers to disperse. Cade then fled, but was followed and killed.

Cadet′, a term applied in a general sense to the younger son of a noble house, as distinguished from the elder son. The term is generally applied also to a youth studying for the army at one of the military colleges or for the navy. In the United States, pupils at the West Point Military Academy and at the Naval Academy at Annapolis are termed cadets.

Cad′illac, MICH., the county-seat of Wexford co., on Little Clam Lake and on the Grand Rapids & Indiana and the Ann Arbor railroads, 96 mi. n. of Grand Rapids. It is picturesquely located in a noted hardwood timber district and has an extensive lumber business. Population in 1910, 8375.

Ca′diz, a seaport of Spain, capital of a province of the same name, 60 mi. n. w. of Gibraltar. It is well built and strongly fortified, and is well paved and very clean. The chief buildings are the great hospital, the customhouse, the old and new cathedrals, the theaters, the bull ring, capable of accommodating 12,000 spectators, and the lighthouse of Saint Sebastian. The Bay of Cadiz, a large basin enclosed by the mainland on one side and a projecting tongue of land on the other, has a good anchorage, and is protected by the neighboring hills. It has four forts, two of which form the defense of the grand arsenal, La Carraca, four miles from Cadiz, at which are large basins and docks. Cadiz has long been the principal Spanish naval station. Its trade is large, its exports being, especially, wine and fruit. Cadiz was founded by the Phoenicians about 1100 B. C. and was one of the chief seats of their commerce in the west of Europe. In the first Punic War it fell into the hands of the Carthaginians, and in the second Punic War it surrendered to the Romans. Population in 1900, 69,382.

Cad′mium, a scarce metal which resembles tin in color and luster, but is a little harder. It is very ductile and malleable, and it fuses a little below a red heat. In its chemical character it resembles zinc. It occurs in the form of carbonate, as an ingredient in various kinds of calamine, or carbonate of zinc. It is also found in the form of a sulphide, as the rare mineral greenockite. Cadmium forms many compounds, of which the sulphide, an orange or lemon-yellow powder used as a coloring agent under the name of *cadmium yellow*, is the most important.

Cad′mus, in Greek legend the son of Agenor and the brother of Europa. When Europa was carried off by Jupiter in the form of a bull, Cadmus was directed by his father to hunt for her and not to return without her. With his brothers, he set forth on the long quest. One by one the brothers became tired out and stopped by the wayside, but Cadmus kept on until informed by an oracle that his search was useless. This oracle also directed him to follow a cow which he should shortly meet; and where she should lie down there he was to found a city. He carried out these instructions, and the city which he founded was Thebes in Boeotia. After killing a dragon which guarded a fountain near the site of his proposed city, Cadmus sowed the teeth of the dragon and there sprang up a group of armed men. These men contended with one another until all but five of them fell, and these five became, with Cadmus, the first inhabitants of the new city. Many inventions and the introduction of the Phoenician alphabet into Greece were ascribed to Cadmus.

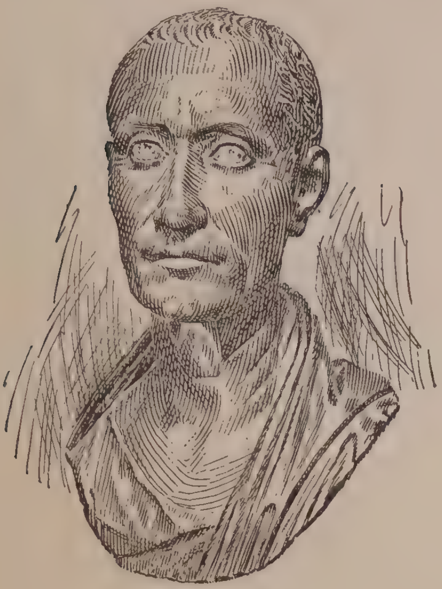
Caduceus, *ka du′se us,* a winged rod entwined with serpents, borne by Mercury as an ensign of quality and office. In modern times it is used as a symbol of commerce, since Mercury was the god of commerce. The rod represents power; the serpents, wisdom, and the two wings, diligence and activity.

Caedmon, *kad′mon,* the first Anglo-Saxon of note who wrote in his own language. He flourished about the end of the seventh century. He was originally a tenant, or perhaps only a cowherd, on the abbey lands at Whitby, but afterward was received into the monastery. His chief work (if it can all be attributed to him) consists of paraphrases of portions of the Scriptures, in Anglo-Saxon verse, the first part of which bears striking resemblances to Milton's narrative in *Paradise Lost.* According to Bede's *Ecclesiastical History,* Caedmon received one night a vision which commanded him to sing the praise of God, and his poetical work began at that time.

Caen, *kahN,* the capital of the Department of Calvados, France, situated on the river Orne, 10 mi. from the English Channel. Caen has many beautiful buildings, excellent specimens of the Norman style of architecture, among the best examples of which are the churches of Saint Etienne, also called Abbaye-aux-Hommes, built by William the Conqueror, and Saint Pierre, famous for its spire. Other public buildings are the castle, founded by William the Conqueror, a university, a museum and a public library containing 100,000 books. Caen is the center of a rich agricultural district, and it carries on extensive manufactures, including lace, crape, cutlery, metal goods and woolen and cotton goods. Valuable building stone is quarried here. Population in 1901, 38,070.

Caesar, *se′zar,* a title, originally a surname of the Julian family at Rome, which after being dignified in the person of the dictator Caius Julius Caesar, was adopted by the successive Roman emperors. The title is perpetuated in the *kaiser* of the German Empire and in the *czar* of Russia.

Caesar, CAIUS JULIUS (100–44 B. C) a famous Roman general, statesman and historian, son of a Roman praetor of the same name. His early sympathies were in favor of democracy, and they were strengthened by his marriage with Cornelia, daughter of Cinna. Refusing to divorce her at the command of Sulla, he was proscribed and compelled to flee from Rome, but after the death of Sulla he returned and again took part in public affairs. He espoused the cause of the people, and his relations with Pompey, a relative of whom he had married, combined with his personal talents to win him great power in the popular party. His attempt to procure the Roman franchise for the Latins beyond the Po secured him the sympathies of the Italians. He was elected to various offices, and in all of them he increased his popularity by lavish expenditures and splendid public games.



CAIUS JULIUS CAESAR

Catiline's outbreak (63 B.C.) brought discredit on all members of the popular party, Caesar not excepted, although it is thought extremely unlikely that Caesar was concerned in it. After a year spent in Spain as propraetor, Caesar returned to Rome, where he became consul. To gain the assistance of colossal wealth, Caesar made a coalition with Crassus, who, being inferior in intellect, became a tool to work Cæsar's will in the accomplishment of his ambition to become master of the Roman world; and on Pompey's return to Rome, Caesar succeeded in reconciling Pompey and Crassus.

Just prior to taking up his duties as consul, Caesar formed with Pompey and Crassus the so-called First Triumvirate. This was not an organized form of government, but simply a union to promote the interests of its members, and in this it differed from the later triumvirates. As consul, Caesar won the favor of the populace by the agrarian law providing for the distribution of land among the poor. After the expiration of his term as consul, Caesar secured a military command in the West, where he hoped to make himself a position similar to the one held by Pompey in the East. Having received the right to conquer Gaul, with the command of four legions of soldiers, he was fairly launched upon the military career destined to make him master of the Roman world. For nine years he was in Gaul, and the final subjugation of the Gauls was accomplished in nine campaigns. In his first campaign he defeated the Helvetii, sending the survivors home to cultivate their land while he overthrew Ariovistus, a German prince who had invaded Gaul. His second campaign was against the Belgae, and in it he defeated four allied tribes united for the defense of Gaul. After wintering at Luca and spending large sums in hospitality, he turned against the Venetii, defeating them totally in his third campaign. His fourth campaign was against two German tribes invading Gaul, whom he defeated and followed across the Rhine. The same year (55 B. C.) he invaded Britain, and won from the senate a thanksgiving lasting twenty days. His second invasion of Britain (54) resulted in the subjugation of the Britons, but it was a nominal subjugation only, as he left no troops to hold the land. His sixth campaign was against revolting Gallic tribes, who were soon reduced to obedience. His most brilliant victory was won in the next year over Vercingetorix, who led a revolt of nearly all the Gallic nations. In the eighth and ninth campaigns (51–50) he accomplished the final subjugation of all Gaul.

Meanwhile matters had changed much in Rome. A stronger alliance of the triumvirs had been formed at Luca, when Caesar was wintering there, but after the death of Crassus, Pompey was forced into a hostile attitude toward Caesar. In 52 Pompey joined the senatorial party against Caesar and procured the passage of a decree ordering the disbanding of Caesar's army. Caesar, with his legions, promptly crossed the Rubicon, which separated his provinces of Gaul from Italy, and advanced toward Rome. Pompey, with the senate and nobles, fled to

A ROMAN COIN

Greece, and in three months Caesar was master of all Italy. He enjoyed his victory but a short time before he hastened to Spain to overthrow Pompey's legates there. On his return from this expedition he was appointed dictator, an office which he held but eleven days. In January he followed Pompey into Greece and defeated him on the plains of Pharsalia, August 9, 48 B. C. When the news of this victory reached Rome, Caesar was appointed dictator for one year, consul for five and tribune for life.

Before Caesar again returned to Rome he brought to a successful issue the Alexandrian War, undertaken to satisfy the claims of Cleopatra against her brother Ptolemy. Returning through Pontus, he defeated Pharnaces and informed the senate of his victory in the laconic dispatch, "*Veni, vidi, vici*" (I came, I saw, I conquered). He defeated the party of Pompey under Scipio at Thespius, and Cato killed himself at Utica rather than fall into the hands of this universal conqueror. Now undisputed master of the Roman world, Caesar showed his greatness and magnanimity by pardoning the followers of Pompey. The dictatorship was bestowed upon him for ten years by a grateful people, and his victories were celebrated by magnificent triumphs.

After his return from defeating the two sons of Pompey in Spain (45), fresh honors were conferred upon him. He was made *imperator* for life, and his portrait was stamped upon the coins of the realm. In the correction of the calendar, which had fallen into great confusion, he performed an important service, and he proposed many public improvements, such as founding public libraries, draining the Pontine marshes, enlarging the harbor at Ostia and digging a canal across the isthmus of Corinth. None of these designs, however, was he allowed to carry out. After the crown had been offered him at a public festival, the aristocracy, all of whom had received favors at his hands, conspired against his life. On March 15, 44 B. C., he was assassinated, receiving over a score of wounds from the daggers of men whom he had believed his friends. Caesar was one of the greatest generals the world has ever known, but he was almost equally great in other ways. As a statesman he was preëminent in his time; as an orator he was second only to Cicero; that he was a masterly historian is shown by his *Commentaries on the Gallic and Civil Wars*.

Caesarea, *ses a re'a,* an ancient town of Palestine, 32 mi. n. of Jaffa. It was built by Herod the Great and was named for Augustus Caesar. The town was elaborately laid out with an amphitheater, temples and many large structures. It was the military capital of Palestine, the Romans having their headquarters there. In the Bible it is noted as the place where Peter preached the gospel to Cornelius, and also as the scene of Paul's two years' imprisonment. After the fall of Jerusalem in 70 A. D., Caesarea became the metropolis of Palestine. During the early Christian centuries it continued to be a place of importance, but in the seventh century the town was conquered by the Mohammedans, and in 1101 it was captured and plundered by the Crusaders. After this it was rebuilt, but it was finally destroyed by the sultan Bibars in 1265.

Caesarea Philippi, an ancient town of Palestine, north of the Sea of Galilee. The modern village of Banias, formerly Paneas, is located on the site of this ancient city. About 20 B. C. the emperor Augustus gave the region around this city to Herod the Great, who beautified it and dedicated it to Augustus. On the death of Herod, his son Philip built here a town and called it Caesarea. It became known as the Caesarea of Philip; hence the name, *Caesarea Philippi*. In Biblical history it is noted as the place where Jesus visited for a short period of rest, at which time he preached to his disciples. The name of the town was later changed to Neronias, in honor of Nero.

Caesium, *se'ze um,* a rare metal, first discovered by Bunsen and Kirchoff by spectrum analysis in 1860. It is soft, and of a silver-white color. It is always found in connection with rubidium and belongs to the same group of elements as lithium, sodium, potassium and rubidium, that is, the group of the alkali metals.

Caffeine, *kaf fe'in,* or **Theine,** *the'in,* the active principle of tea and coffee, a slightly bitter, highly nitrogenous substance, crystallizing in slender, silk-like needles and found in coffee beans, tea leaves, Paraguay tea, guarana and kindred plants. Coffee contains from 0.8 to 3.6 per cent of caffeine, and tea from 2 to 4 per cent. It is used in medicine to some extent. but in large doses it is a poison.

Caf'tan. See KAFTAN.

Cagliari, *ka lyah're,* the capital of the province of that name, and of the island of Sardinia, said to have been founded by the Phoenicians. It contains a cathedral, about thirty churches, an amphitheater, botanical gardens, three theaters, a university which was founded by Philip II of Spain in 1596, and a library which contains over 70,000 volumes. The chief manufactures are firearms, powder, soap, leather and cotton goods. The exports are grain, wine, oil, salt and goatskins. Cagliari is the emporium through which nearly all the trade of Sardinia passes. Population of commune in 1901, 54,000.

Cagliostro, *ka lyo'stro*, COUNT ALESSANDRO (1743–1795), an Italian adventurer, whose real name was Guiseppe Balsamo. In company with a certain sage named Althotas, he traveled over Greece, Egypt and Asia, and picked up considerable miscellaneous knowledge, which he used for the purpose of swindling people. Returning to Italy, he posed at various times as a physician, alchemist, philosopher, Freemason and necromancer. One of his specialties was an "elixir of youth." He married a Venetian woman, Lorenza Feliciana, whose beauty and cleverness made her a valuable accomplice in his frauds. Together they traveled through Italy, France, Germany and England. In Paris, in 1785, he was implicated in the affair of the Diamond Necklace and was imprisoned for a time. On regaining his freedom he resumed his swindling schemes, but became more and more unpopular, until, finally, he was condemned to life imprisonment. His wife passed her last years in a convent.

Cagot, *ka go'*, a name given to a race of deformed dwarfs among the peasants of the Pyrenees. These people were shunned and set apart by their fellow Christians. The priest handed them the wafer at the end of a stick. The most repulsive labor was assigned to them by the town authorities, but they were allowed to be carpenters and rope makers.

Cahors, *ka or'*, a town in southern France, situated on a rocky peninsula. Under the Romans it was adorned with a temple, a theater, baths, an immense aqueduct and a forum, remains of which are still to be seen. Among the principal edifices are the cathedral and an episcopal palace, now converted into the prefecture. Population in 1901, 11,738.

Caiaphas, *ka'ya fas*, a Jew, the high priest at the time of the crucifixion. He was deposed in 35 A. D., and Jonathan, the son of Annas, was appointed in his stead. (*Matt.* XXVI, 57.)

Caicos, *ki'kos*, (Spanish, *cayo*, rock, islet, key), a group of islands belonging to the Bahamas. They consist of six islands, besides some uninhabited rocks, and they have an area of 169 square miles. The largest, called the Great Key, is about 30 miles long. The inhabitants are few in number and are mostly engaged in fishing, the preparation of salt and the cultivation of sisal hemp. In 1873 the Turks Islands and the Caicos were united into a commissionership under the governor of Jamaica. Population, 4774.

Cain, *kane*, the eldest son of Adam and Eve. He slew his brother Abel. (*Gen.* IV.)

Caine, *kane*, THOMAS HENRY HALL (1853–), an English novelist, born at Runcorn, England, and educated in the schools of the Isle of Man and Liverpool. He was educated to be an architect, but preferred journalism, and for six years was a leading writer on the Liverpool *Mercury*. On the invitation of Dante Rossetti, Caine went to London in 1881 and lived with Rossetti until the death of the latter in 1882. During the last year of the poet's life Caine prepared his *Recollections of Rossetti*. This was followed by his *Songs of Three Centuries*, and the next year by *Cobwebs of Criticism*. After this, Mr. Caine began his career as a novelist. After 1885 he produced, among other books, *The Shadow of a Crime*, *The Son of Hagar*, *The Deemster*, *The Bondman*, *The Manxman*, *The Christian* and *The Eternal City*. Several of his novels have been dramatized

Cairn, a heap of stones built up over a grave, or as a landmark. These heaps are very common in Great Britain, particularly in Scotland and Wales where they are generally of a conical form. Some are evidently sepulchral, containing urns, stone chests or bones; some were evidently erected to commemorate some great event, while others appear to have had a religious significance. A religious or mystical meaning still attaches to the building of cairns among many primitive tribes, and they are usually erected, not all at one time, but by each passer-by adding a stone to show his interest in the object for which the heap was begun.

Cairo, *ki'ro*, (Arabian, Masr-el-Kahira), the capital of Egypt and the largest city of Africa, situated on the right bank of the Nile, 150 mi. s. e. of Alexandria. The city is partly surrounded by a fortified wall, and is divided into several separate parts. The old Arabian quarter has narrow, crooked, unpaved streets, lined with high stone houses. The modern portion has such conveniences as gas-lighting and electric street railways, and has broad avenues and beautiful buildings. Among the chief interests of Cairo are the numerous mosques, which are considered the best examples of Arabic architecture. The Gami-ibn-Tulun, erected about

879, is the finest, and the Gami-Amra is the oldest. Of this, only a portion is left. Among other mosques are the Mehemet Ali, a structure of great merit, having high minarets of alabaster, and the mosque of Kait Bey, dating from the fifteenth century. Cairo formerly had many obelisks, but most of these have disappeared and are now in various European and American cities.

Cairo ranks high as an educational center, among its institutions the most important being the El-Azhar, considered the oldest university in the world. Besides these, there are schools of art and medicine, a polytechnical school and a library which contains 50,000 volumes. Cairo is the residence of the khedive and is the seat of administration of Egypt. The trade is large, and the bazaars and markets are numerous. The manufactures include metal articles, textiles and essences of flowers. Old Cairo was founded in 640 by Amru, the conqueror of Egypt, near the old town of Babylon. It was the capital of the country until 973. Through the Middle Ages the city was one of the chief centers of Mohammedan learning, and the center of trade between Europe and the East. From 1798 to 1801 it was held by the French, later passed to the Turks and through them to Mehemet Ali, the founder of the present dynasty. Population, 570,000.

Cairo, *ka'ro,* ILL., the county-seat of Alexander co., at the junction of the Ohio and Mississippi rivers, on the Illinois Central, the Mobile & Ohio and other railroads. It is in an agricultural district, and it also has numerous manufactures and a large trade in farm products and lumber. Cairo was settled about 1836, but its growth was hindered by frequent floods, until levees were constructed along the river. During the Civil War large quantities of military supplies were stored here by the Federal government. Population in 1910, 14,548.

Caisson, *kase'son,* in civil engineering, a water-tight box, or casing, used in building structures in water too deep for the cofferdam, such as piers of bridges and quays. The caisson is sunk to the bottom of the river and is large enough to contain the entire structure to be built within it. The pneumatic caisson is an air-tight chamber, sunk to the bed of the stream and entered through an air lock. Ventilation is secured by air pumps. The term *caisson* is sometimes applied to floating docks. See DOCK.

Caisson, the ammunition wagon attached to a piece of field artillery. It consists of a limber, like that attached to the cannon itself, and a caisson proper, of two wheels on an axle, carrying two ammunition chests and various repair supplies.

Caj'eput Oil, the volatile oil obtained from the leaves of the cajeput tree, a native of the Indian Archipelago and some parts of Australia, or from others of the same genus. It is highly valued for its medicinal properties, being regarded by the Malays as a cure for all ills. In the United States it is used externally in chronic rheumatism, and as a cure for cholera, dyspepsia and other disorders. Because of its high price, cajeput oil is often diluted with turpentine, oil of rosemary and other similar oils.

Cal'abar Bean, the seed of an African plant, nearly allied to the kidney bean. It is so powerful a narcotic poison that six beans will produce death. The calabar bean is the famous "ordeal bean" of Africa, administered to persons suspected of witchcraft. If the accused vomits the bean and recovers, it is a sign of innocence. It is employed in medicine, chiefly as an agent for producing contraction of the pupil of the eye and for neuralgia, lockjaw and rheumatism.

CALABAR BEAN

Cal'abash, a vessel made of a dried gourd shell or of a calabash shell, used in some parts of America and Africa for holding liquids. They are so close-grained and hard that they will hold any liquid, and they may be put several times on the fire as kettles.

Calabash Tree, the popular name of certain American trees or shrubs, given to them because of their large, gourd-like fruits, the hard shells of which are made into such domestic utensils as basins, cups, spoons and bottles. The name is also given to the baobab of Africa.

Cala′bria, a name applied to the three provinces which constitute the southwest peninsula in which Italy terminates. The central region is occupied by the great Apennine ridge, to which whole colonies, with their cattle, migrate in the summer. Wheat, rice, saffron, anise, licorice, madder, flax, hemp, olives, almonds and cotton are raised in abundance. The sugar cane also comes to perfection here. The minerals include alabaster, marble, gypsum, alum, chalk, rock salt and lapis lazuli. The fisheries are valuable. Population in 1901, 1,370,208.

Calais, *ka la′*, a fortified seaport town of France, in the Department of Pas-de-Calais, 25 mi. s. e. of Dover. The Old Town, or Calais proper, has a citadel, and was till recently surrounded by fortifications, but the modern suburb of Saint Pierre having been united with Calais proper, both are now surrounded with forts and other works. The chief buildings are a Gothic cathedral, the old town hall and a museum. Calais has considerable exports, but the town derives its importance largely from being the chief landing place for English travelers to the Continent. It has important manufactures of cotton and silk bobbinet lace. In 1347 Calais was taken by Edward III of England, after a siege of eleven months, and in 1558 it was taken by the duke of Guise. Population in 1900, 58,197.

Calais, *kal′is*, Me., the county-seat of Washington co., 120 mi. e. of Bangor, on the Saint Croix River, opposite Saint Stephen, N. B. There are extensive marble and granite quarries; the town has a large lumber trade, and shipbuilding is an important industry. The first settlement was made in 1779. Population in 1910, 6116.

Cal′aman′der Wood, a beautiful species of wood, the product of a tree, native of Ceylon, belonging to the same genus as the ebony and the persimmon tree. It resembles rosewood, but it is so hard that it is worked with great difficulty. It takes a very high polish and is used for chairs and tables, and it yields veneers of almost unequaled beauty.

Calamianes, *ka lah′me ah′nais*, a cluster of islands in the western part of the Philippine Archipelago. They produce good timber, honey and wax.

Cal′amint, a plant, some species of which are known respectively by the names of mountain balm, catmint, basil balm and wild basil. The first, also termed common calamint, has aromatic leaves, employed to make herb tea.

Cal′amus, a genus of plants, the stems of the different species of which are the rattan canes of commerce. The genus holds a middle station between the grasses and palms, growing like the former but with flowers like the latter. The species are principally found in the hotter parts of the East Indies. See Sweet Flag.

Calash, *kah lash′*, or **Caleche**, a two-wheeled carriage, or sort of cart, having a folding top; it has a seat for two passengers and a narrow seat on the dashboard for the driver. The calash is in very general use among the French people of Canada.

Calatrava la Vieja, *kah′la trah′vah lah vya′hyah*, a ruined city of Spain, situated on the Guadiana, near Ciudad Real. In the Middle Ages it was a strong fortress, but only a single tower now remains. Its defense against the Moors in 1158 is famous, because it originated the Knights of Calatrava, an order of chivalry founded by Sancho III.

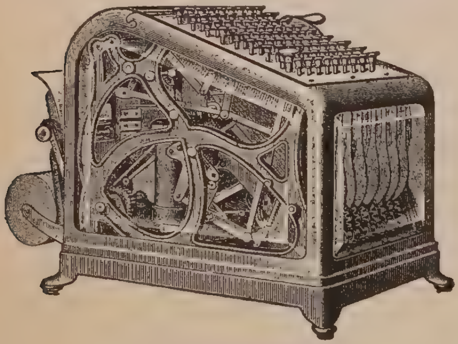
Calceolaria, *kal′se o la′re ah*, or **Slip′perwort**, a genus of ornamental plants. All the species are South American, but they are extensively cultivated as garden shrubs or as house plants in pots. Most of them have yellow flowers, some have brownish-purple ones and some have the two colors intermixed. while others are white. The greater number in cultivation are hybrids and not true species. They get their name from the shape of the corolla, which resembles a broad, short, much inflated slipper.

Calcination, *kal′se na′shun*, the operation of roasting a substance or subjecting it to heat, generally with the purpose of driving off some volatile ingredients. It is the first step in the extraction of the majority of the common metals from their ores. In the manufacture of lime and cement, calcination is an essential process. The term was formerly also applied to the operation of converting a metal into an oxide or metallic calx; this is now called *oxidation*.

Calcite, *kal′site*, a term applied to various minerals, all of which are modifications of crystallized carbonate of calcium. Calcite includes limestone, all the white and most of the colored marbles, chalk and Iceland spar. Each of these is described under its title.

Calcium, *kal'se um,* in its pure state one of the rarest of substances, but in its combinations one of the most abundant and most widely distributed. It is a metallic basis of lime, and as a phosphate it forms the main part of the mineral matter of the bones of animals. As a carbonate it appears in chalk, limestone and marble, and as a sulphate it forms large deposits known as gypsum. Besides, it appears as a constituent in many minerals, such as fluorspar and Iceland spar, and is found in all soils, in the ash of plants, dissolved in sea water and in all springs. When quite pure it is a pale yellow metal with a high luster. It is about one and a half times as heavy as water, and is ductile and malleable. For the most part its salts are insoluble, or sparingly soluble, in water, but they dissolve readily in dilute acids.

Cal'cula'ting Machines, machines for performing various arithmetical operations, such as adding, multiplying, subtracting and dividing. Calculating machines are of many patterns. The simplest form is the register used on street cars. This contains a number of wheels, each of which bears the ten figures used in reckoning. When the cord which operates the register is pulled, the wheel representing units moves so as to mark the number next higher than the one previously registered. In making a complete revolution, this wheel registers the 10 unit marks. At this point the second wheel is moved to mark 1. When the second wheel has marked 10, which would mean 100 for the first wheel, the third wheel marks 1, and so on.



CALCULATING MACHINE

Calculating machines used in banks, insurance offices and other places where computations are extensive, have a keyboard arranged something like that of a typewriter. The keys are arranged so that the numbers stand in columns from 1 to 9. When any key is pressed, it marks that figure upon a slip of paper. As many keys as the machine has columns can be pressed at once. The pressing of another key gives the result of additions or subtractions, and some machines have arrangements which will also give multiplications. The latest patterns of these machines are now operated by electricity. See CASH REGISTER.

Cal'culus, a general term applied to all classes of mathematical computations; specifically, it is the name given to the highest branch of mathematics, whose field is investigation of the properties of variable quantities and especially of their rate of change. This rate of change is known as the *differential* of the variable. The processes and principles by which the differential of known variables is found is called *differential calculus.* The converse of these processes, that is, the finding of the variable, having known its differential, is called *integral calculus.* The problems of the latter class can be solved only in special cases. Calculus has been of inestimable value in the development of all the sciences, and it has made possible some of the most important recent advances in the fields of astronomy, physics and mechanics.

The theory of calculus was expounded almost simultaneously about 1670 by Sir Isaac Newton and William Leibnitz. The latter published his conclusions first, and the notation devised by him is now most commonly used. Newton called his theory the *theory of fluxions* or *infinitesimal calculus.* The *fluxion* in his system was exactly equivalent to the *differential* explained above. Modern mathematicians have extended the method of calculus into other fields of mathematics, and hence separate branches of the subject have been developed, such as *calculus of variations* and *calculus of functions.*

Calculus, in medicine, a general term for the stony formations which appear in various parts of the body, such as the bladder, the kidneys or the gall bladder. When the particles in the bladder are comparatively small, the disease is known as gravel. See LITHOTOMY.

Calcut'ta, capital of British India and of Bengal, situated on the Hugli River, a branch of the Ganges. It is the headquarters of the governor general of India, and the seat of the Indian government. The city extends along the river bank for about 4½ miles, and in breadth is about 1½ miles, the entire site of Calcutta proper being about 8 square miles Adjacent to the city itself, however, are extensive suburbs, which include the large town of Howrah, on the opposite side of the Hugli, connected with Calcutta by a pontoon bridge. The houses of the south, or British, quarter of Calcutta are of brick and are elegantly built, many of them like palaces, in striking contrast with the northern quarter, occupied by the natives, which has narrow, crooked and ill-kept streets. On the west side is an extensive wharf about 2 miles long, called the Strand.

Outside the city, between the river and the fashionable quarter, lies Fort William, the largest fortress in India, a magnificent octagonal structure, which cost altogether $10,000,000, mounts over 600 guns, contains 80,000 stands of arms and will hold 15,000 men. The plain between Fort William and the city forms a favorite promenade. At the north side, called the Esplanade, stands the government house, or palace of the governor general, built by the Marquis Wellesley, at an expense of $5,000,000. Other edifices worthy of notice are the townhall, supreme court, government treasury, writers' buildings, Metcalfe Hall, mint, theater, medical college, general postoffice, general hospital, the new cathedral and the old cathedral. There are also numerous educational institutions here.

Calcutta has an extensive system of internal navigation, through the numerous arms and tributaries of the Ganges, and it almost monopolizes the external commerce of Bengal. The principal exports are opium, cotton, rice, wheat, jute, gunny bags, tea, indigo, seeds and raw silk. Of the imports the most important in respect of value are cotton goods, besides linens, silver, spirits and salt. In 1686 a factory of the East India Company was established here, and in 1700 three adjoining villages were presented to the company by the emperor of Delhi. The settlement was then fortified and was called Fort William, in honor of the king of England, but subsequently it received its present name, which had been that of one of the villages. Calcutta was made the capital of a presidency in 1707, but it first figures in history in connection with the events of 1756. In that year it was attacked suddenly by Surajah Dowlah, and after a stout siege it was shamefully deserted by the officers on duty. In two days more, disturbances within the town itself led to its surrender (See Black Hole of Calcutta). Eight months later Clive and Admiral Watson rescued Calcutta, which soon afterward entered on its modern career of prosperity. The town became the general seat of government of British India in 1773. Population in 1901, 1,321,664.

Caldecott, *kal'de kot,* Randolph (1846–1886), a noted English artist. He entered a bank, but gave up banking for art. His first success was the publication, in 1875, of his illustrations of a volume of selections from Washington Irving's *Sketch-Book,* under the title of *Old Christmas.* It was followed by his illustrations of *Bracebridge Hall,* Blackburn's *Breton Folk* and *Aesop's Fables with Modern Instances.* His most popular work, however, was the series of colored books for children, including *John Gilpin,* the *Elegy on the Death of a Mad Dog* and the *Great Panjandrum.*

Calderon de la Barca, *kahl da rone'da lah bahr'kah,* Pedro (1600–1681), after Lope de Vega the greatest Spanish dramatist, educated in the Jesuits' College, Madrid, and at Salamanca. Before his fourteenth year he had written his third play, and soon after he was twenty he won the praise of eminent critics. He served for a time in the army and later entered the priesthood, but he continued his dramatic writings. He left a large number of religious plays, in addition to his regular dramas, about one hundred twenty in number. He wrote his last play in the eightieth year of his age.

Caleche, *ka laysh'.* See Calash.

Caledo'nia, the name by which the northern portion of Scotland and its inhabitants first became known to the Romans, when in the year 80 Agricola occupied the country up to the line of the Firths of Clyde and Forth. He defeated the Caledonians in 83, and again at Mons Grampius in 84, in a battle of which a detailed description is given by Tacitus. The Caledonians became the Scots and Picts of early English and Sctoch history. See Scotland.

Caledonian Canal, a waterway passing through Glenmore or the Great Glen of Scotland, allowing vessels of five hundred or six hundred tons to sail from the Atlantic to the North Sea, the whole distance from sea to sea being about sixty miles, of which only twenty-two consist of canal proper. The scenery is of the finest in Scotland, this route being extremely popular with tourists.

Cal'endar, a record or register showing the division of time into years, months, weeks and days. The name is derived from the word *calends,* which was the first day of the Roman month. On this day it was the custom among the Romans for the *pontifex maximus* to call out or proclaim the month and the festivals to be observed during the month. The first division of time resulted from the regular occurrence of certain phenomena of nature; for instance, the changes of the moon suggested the division into months, making the months of twenty-nine or thirty days' time. Then the regular motion of the sun and the occurrence of the seasons divided time into years. The division into weeks, the only division not based on natural causes, was based on the observation of the law of Moses, which decrees the seventh day as the day of rest. The year of the ancient Egyptians is based on the changes of season alone, without reference to the changes of the moon, their year consisting of 365 days, divided into twelve months of thirty days each, with five extra days at the end of the year. The year of the Jews consisted of twelve lunar months, with the thirteenth month inserted, when necessary, in order to accommodate it to the sun and the seasons. The Greek year had twelve lunar months of thirty and twenty-nine days, alternately. This made the year have 354 days, but a change was made later by which a month of thirty or twenty-nine days was introduced every other year. Still later another change was made by which the intercalary month was omitted once in about every eight years, making the average year have 365¼ days. The Greek month was divided into three decades of ten days each.

The Romans divided their year into ten months, but in the course of time this was changed to twelve months, making 355 days, and an intercalary month was sometimes introduced. The general confusion of this calculation led Julius Caesar to remedy the arrangement by the use of the Julian calendar, in which the year has 365 days and every fourth year, or leap year, 366 days, making the average year have 365¼ days. This calendar remained in use among the Romans until 1582, when it was found that the vernal equinox took place ten days earlier than its date in the calendar. Pope Gregory XIII remedied this error of time in the Gregorian, or Reformed, calendar, the one which is in use to-day. Pope Gregory ordained that ten days be subtracted from the year 1582, and every hundredth year, as 1600, 1700 and 1800, should be a common year and not a leap year, as in the old calendar, but every fourth hundred, as 2000, 2400, 2800 and so on, should be a leap year. The new calendar was adopted in Spain, Portugal, Italy and France, the other countries, Switzerland, Germany, the Netherlands, Poland, Hungary, Holland and Denmark following in succession. It was not until 1752 that the Gregorian calendar was adopted in England, with the commencement of the year set on January first. Sweden followed England in 1753. Russia and those countries following the communion of the Greek Church still retain the old Julian calendar, which differs twelve days from the new.

During the French Revolution a new calendar was introduced by the decree of the National Convention, 1793, in which the new reckoning dated from September 22, 1792, the day when the new republic was supposed to have begun. This calendar had a year consisting of twelve months of thirty days each, and five days were added at the end of each year. Each month was divided into decades of ten days each. Napoleon had this calendar discontinued and the Gregorian was reëstablished in 1805.

Cal'ender, a machine consisting of two or more cylinders (calenders), revolving so nearly in contact with each other that cloth or paper passed between them is smoothed and glazed by their pressure. See Paper.

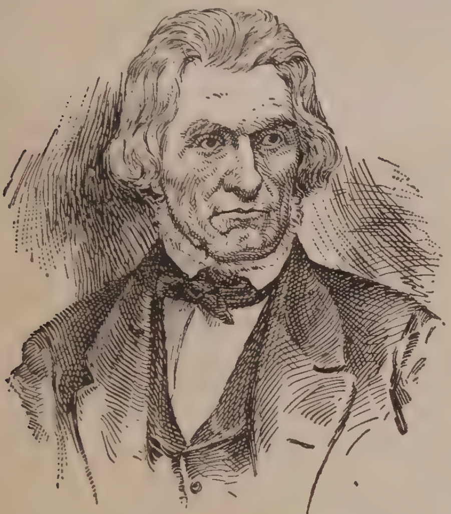
Cal'ends. *The Greek calends* was an ancient Roman phrase meaning *never*, which originated in the fact that the Greeks had nothing corresponding to the Roman calends. See Calendar.

Cal'gary, a town in Canada, on the Canadian Pacific Railway, near the eastern base of the Rocky Mountains, in the district of Alberta. It is the center of an important cattle and horse-ranching district. The Sarcee Indian Reserve lies to the southwest of the town. Population in 1909, 32,000.

Calhoun, *kal hoon'*, John Caldwell (1782–1850), a distinguished American statesman, born in South Carolina, of Scotch-Irish descent. Because of poverty, he received little early education. However, by arduous study and by the help of his brother-in-law, he was able to enter Yale College as a junior and graduated with high honors in 1804. He entered the profession of law and began his practice in Abbeyville, S. C., but soon his ability and integrity secured him an election to the legislature and then to Congress. He immediately became conspicuous as both orator and statesman. At first he was a warm follower of Henry Clay and was a strong nationalist in his views, favoring a powerful navy, the United States bank and a protective tariff. In 1817 he was made secretary of war and displayed remarkable ability.

He was elected vice-president with John Quincy Adams in 1824, but during this administration his views gradually changed, and he was elected vice-president with the radical

Democrat, Andrew Jackson, in 1828. In this year also he became a prominent opponent of the protective tariff, as a representative of the agricultural states of the South, and prepared a famous paper affirming the right of a state to refuse to submit to any law of Congress which it considered unconstitutional. This led to a separation of interest between Calhoun and Jackson, which became constantly more marked until it culminated in the open contest over nullification in 1833. Calhoun urged nullification as a state right; Jackson took the opposite view, and by a firm and prompt display of Federal authority he succeeded in putting down the sentiment both for secession and for civil war. For the rest of his life Calhoun was a powerful advocate of states rights and, incidentally, of slavery, for it was upon the question of slavery, chiefly, that the states found themselves at odds with the Federal government. As a member of the Senate from 1832 to 1843, he supported President Van Buren's sub-treasury scheme, denounced the tariff of 1842 and supported the Webster-Ashburton Treaty. In 1844 he was appointed secretary of state by President Tyler, was partly responsible for the annexation of Texas and indirectly for the Mexican War, though he opposed the latter. He again entered the Senate in 1845, and from that time on he was prominent chiefly as an ardent advocate of slavery and the Southern cause. His last speech was in favor of the Compromise of 1850, but it was read, on account of his illness, by a colleague. During his last months he wrote his famous *Disquisition on Government* and his *Discourse on the Constitution and Government of the United States*, remarkable discussions of constitutional questions. Calhoun's personality, character and bearing were exceedingly attractive, and as orator and statesman he possessed abilities which have rarely been equaled in America; but environment and prejudice led him to advocate an impossible doctrine, namely, the construction of a powerful federal nation whose constituent states were practically independent.



JOHN CALDWELL CALHOUN

Cali, *ka le'*, a town of Colombia, situated on the Cali River, near its junction with the Cauca, and 3100 feet above the sea. The city has some manufactures and carries on a good trade with the surrounding country. Cali was founded in 1556. Population, 16,000.

Cal'ico Printing, the art of applying colors to a cloth in such a manner as to form patterns and figures. This art originated in India and is sometimes used in stamping linen, woolen and silk, but generally in stamping the variety of cotton cloth known as *calico.* Originally the patterns were carved on blocks of wood, which were laid on the cloth by hand. Each block contained the portion of the figure which impressed a single color, and great care was necessary in laying on the blocks, so as not to mar the pattern.

Calico printing is now done by a printing press which in its general plan and structure somewhat resembles the cylinder press used for printing paper. The important parts of this press are a large cylinder, or drum, around which the cloth passes, and several smaller copper cylinders upon which the pattern is engraved, and which are so placed that as the cloth passes around the drum, the portion of the pattern upon each cylinder is impressed upon the cloth. Each of the engraved cylinders is supplied with coloring matter by contact with a wooden cylinder covered with cloth and dipping into a trough containing the dye.

The figures are engraved upon the cylinder either by pressing them against a cylinder of hard steel, upon which the pattern is cut in raised figures forming dies, or by etching with acid. By either process the pattern is sunk into the surface of the engraved cylinder. When brought in contact with the dye, the figures are filled with the substance, and a steel plate called the *color doctor* presses against the surface and removes all dye except that in the sunken figures forming the patterns. As the cloth is pressed against the cylinder it absorbs the dye from these figures and thus has the pattern stamped upon it. Each color or tint requires a separate cylinder, and, by increasing the size of the drum, as many as twenty colors can be used at a time. The engraved cylinders are so adjusted that the different parts of the pattern will fit to one another.

Calico printing is done by three methods, known as *direct printing*, *combined printing and dyeing* and *discharge and reserve* methods. By the first method, the pattern is stamped directly upon the cloth in the colors which it is intended to contain. This method is now but little used, because the goods printed by it fade quickly. The combined printing and dyeing method makes use of mordants (See DYEING) and is subject to a great many variations. It is based upon the principle that the same dye, when treated with different mordants, will produce different colors. By this method the mordants are stamped upon the cloth, and it is then dipped in a dye, after which the colors are fixed by exposure to air or to steam heat. This method produces what are known as *fast colors*, that is, colors that will not fade. The discharge and reserve method consists in treating the cloth so that certain portions of it are white when the process is completed. This is done either by stamping upon the cloth some substance, such as clay or wax, that the color will not penetrate, or by stamping upon certain parts of the figure a substance which, when moistened, will dissolve the color. Most of the patterns in blue and white are printed in this way.

Cal'icut, a seaport of India, in the province of Madras, on the Malabar coast, 566 mi. s. e. of Bombay. It was the first port in India visited by Europeans, the Portuguese adventurer, Pedro da Covilham, having landed here about 1486, and Vasco da Gama in 1498. It has considerable trade in timber and spices, and it has manufactures of cotton cloth, to which it has given the name *calico*. Population in 1901, 75,500.

Califor'nia, the GOLDEN STATE, the second largest state in the Union, is bounded on the n. by Oregon, on the e. by Nevada and Arizona, on the s. by Mexico and on the w. by the Pacific Ocean. Its length from north to south through the center is 750 miles, its average width is 200 miles, the area of the land surface is 155,980 square miles and the length of the coast line is 1200 miles. It is more than five times the size of Maine, as large as Montana and Connecticut combined and about two-thirds the area of the German Empire. Pop., 1910, 2,377,549.

SURFACE AND DRAINAGE. The Sierra Nevada Mountains extend along the eastern boundary for nearly the entire length of the state, and west of these and nearly parallel with them is the Coast Range. At the north these are connected by spurs of the Cascades, which contain a number of prominent peaks, among them Mount Shasta, far-famed for its grandeur and beauty. To the south these ranges are connected by the Tehachapi Mountains. Within this mountain enclosure is a large plain over 400 miles long and having an area of about 18,000 square miles. The surface is mostly level and the soil fertile, making this plain one of the most valuable agricultural regions in the world. The plain is divided into the Sacramento and the San Joaquin valleys, each being occupied by its respective river. Between the spurs of the Coast Range, the foothills and the Sierra Nevadas are numerous fertile valleys, sheltered from wind and fog. When supplied with water these valleys produce abundant crops of semi-tropical fruits and of vegetables, for which this part of the state is famous.

South of the Tehachapi Mountains is that part of the state usually known as Southern California. The region is more or less broken, but the mountains are not so high as those further north. Near the southern boundary is one of the most remarkable depressions in the world, Death Valley, whose surface is in some places more than 250 feet below sea level. In the valley is a lake known as Salton Sea.

This blending of mountain, plain and valley gives to the scenery of California grandeur and beauty which must be seen to be appreciated. The state contains 41 peaks exceeding 10,000 feet in altitude, eleven exceeding 13,000, and Mount Whitney, 14,898 feet, is the highest peak in the United States. The western slope of the Sierra Nevadas contains many deep canyons in which are found rushing streams and beautiful cascades. The most famous of these is Yosemite Valley (See YOSEMITE), because it is the most accessible, though it would have a number of rivals were they equally well known. Mountain lakes remarkable for the purity of their water are of frequent occurrence. Lake Tahoe, between California and Nevada, and a number of others rival the famous Swiss lakes in beauty.

The great valley in the interior is drained by the San Joaquin and Sacramento rivers, which unite before they enter San Francisco Bay, and each of which is navigable for a considerable distance. Among the mountains and foothills are found numerous rapid streams, which are fed by melting snows and are used either for irrigation or for the production of electric power. West of the Coast Range the Salinas River waters the west central portion of the state, and in the north are the Klamath and the Eel. The mountain regions contain numerous lakes noted for their high altitude and beautiful scenery. The most widely known of these is Lake Tahoe.

Climate. In latitude California extends from that of Savannah, Ga., to that of Boston, Mass., but the climate is entirely different from the Eastern states included between these parallels. The variations in temperature are due to altitude rather than latitude, and the climate in the northern end of the state is as mild and salubrious as in the southern. The great central valleys are so protected by the mountains that the same fruits grow in the north as in the south. The mildness of the climate is due very largely to the warm winds from the Pacific, which owe their temperature to the Japan Current. Except upon the high elevations, live stock can remain out of doors throughout the year, and there is always sufficient grass for grazing. Roses and other flowers blossom the year round, and oranges, lemons and other semi-tropical fruits are raised in the valleys throughout the state. The high altitudes of the Sierra Nevadas have a cool climate, and the highest peaks of this range are covered with perpetual snow. Instead of being divided into winter and summer, the year is characterized by wet and dry seasons, the former lasting from October to April, and the latter occupying the remainder of the year. The rainfall varies in different localities. In the mountainous regions and the San Joaquin and Sacramento valleys it is sufficient for nearly all agricultural purposes, though certain localities are greatly benefited by irrigation; but south of the Tehachapi Mountains the rainfall is very light and irrigation is necessary to successful tillage.

Mineral Resources. The mining interests are widely extended over the state and include the mining of a large number of products. The annual output of the mines exceeds $66,000,000, and it is rapidly increasing. Among the most valuable of mineral products are gold, petroleum, found in all parts of the state, copper, silver, quicksilver, borax, manganese and various clays, valuable in manufactures. Gold is widely distributed, being found in thirty-four of the fifty-seven counties, and since its discovery, in 1848, more than $1,500,000,000 worth has been taken from the mines. Diamonds are found in some localities, and other precious stones occur in San Diego County.

Agriculture. The great valleys of the Sacramento and San Joaquin are remarkably fertile and are adapted to all agricultural products suited to a temperate or semi-tropical climate. Grains, vegetables, all kinds of fruits, almonds and walnuts are extensively raised in this part of the state. The soil of the arid regions seems equally fertile, and wherever water can be obtained for irrigation, the farmer receives ample returns. The fruit-growing region south of the Tehachapi Mountains is all in the irrigated district. The leading fruit crops are prunes, oranges and grapes. Over 275,000 acres in the state are devoted to grape culture, and the orange crop amounts to about 40,000 carloads each year. The grapes are used for the table, for raisins and for wine. The total value of the fruit crop exceeds $65,000,000 annually.

The mild climate and wide extent of grazing land make the raising of live stock an important and profitable industry. Poultry raising and dairying are also of considerable value, and in the valleys around Sacramento and in the vicinity of San Francisco truck gardening is extensively carried on.

Manufactures. Since the discovery of petroleum, the manufactures of California have developed rapidly. Many of the mountain streams also furnish the basis for electric power, some of which is conveyed long distances and is used in operating machinery. Shipbuilding is an important industry, and San Francisco contains one of the most complete ship-building yards in the country. There are also extensive sugar refineries in the state, and the lumber industry gives employment to about 12,000 men and yields an annual output of about $17,000,000. The canning of fruit and vegetables is an important industry in several parts of the state, as is the manufacture of olive oil.

Transportation. By many persons San Francisco is considered to have the finest harbor in the world, and within it are found ships from all countries of the Orient and from many ports of the United States and South America. The advantages which this harbor affords make San Francisco the most important seaport on the Pacific coast, and her foreign trade amounts to over $100,000,000. Railway connections with the other states of the Union are furnished by numerous trunk lines extending across the continent, and the Southern Pacific has lines extending from Los Angeles to Portland, Ore., with numerous branches, so that nearly all parts of the state are now within easy reach of railway transportation. Good harbors are also found at San Diego, San Pedro and Eureka. Electric lines connect some interior towns and those in and about Los Angeles, and form an extensive system, which affords cheap and convenient transportation to the inhabitants of a large region.

Government. The legislature consists of a senate of 40 members, elected for four years, and an assembly of 80 members, elected for two years. Sessions are held biennially. The executive power is vested in a governor, lieutenant governor, secretary of state, attorney general, controller, treasurer and surveyor-general, each elected for four years. The Supreme Court consists of a chief justice and six associates. The other courts are district courts of appeal, superior courts and justice courts. The present constitution was adopted in 1879.

Education. The state maintains one of the best public school systems in the Union and has always been known for the high standard of qualification demanded of its teachers. The schools are provided with funds through a system of state taxation, and in addition to the common schools there are high schools in all counties except four, five normal schools for the training of teachers, and two universities—the University of California at Berkeley and Leland Stanford Jr. University at Palo Alto (See California, University of; Leland Stanford Junior University). The Preston School of Industry is maintained at Ione.

Institutions. The charitable institutions are asylums for the insane at Agnew, Napa, Stockton and Ukiah, the home for the feeble-minded at Glen Ellen and the school for the deaf, dumb and blind at Berkeley; also orphan asylums in different parts of the state. The penal institutions include prisons at Folsom and San Quentin and a state reform school at Whittier.

Cities. The important cities are Sacramento, the capital, San Francisco, Los Angeles, Oakland, San José, San Diego, Stockton, Berkeley, Alameda, Fresno City, Santa Rosa and Pasadena, each of which is described under its title.

History. California takes its name from a fabled island that was supposed to exist in the western sea somewhere near the equator. Lower California was visited by the Spaniards in 1533, but the first exploration within the bounds of the present state did not occur until 1542, when Cabrillo visited the vicinity of Santa Barbara. In 1548, Sir Francis Drake explored the coast as far north as the 48th parallel and named the country New Albion. The first Spanish mission was founded in 1769 at San Diego, and by 1821 twenty-one missions were in successful operation. In 1777, the Spaniards began the establishment of towns, which after the Mexican revolution in 1821 gradually increased and expanded. The first American emigrant wagon reached the state in 1862. During the Mexican War the American forces under Colonel Fremont and Commodore Sloat took possession of Sonoma, San Francisco and other important posts. An attempt was made at Sonoma to organize a republic, but by the Treaty of Guadalupe-Hidalgo the territory became a possession of the United States. On Jan. 24, 1848, gold was discovered at Sutter's Mill, near Coloma. The news of this discovery led to an influx of settlers from all parts of the world, and in 1849 the population exceeded 100,000. Several attempts were made to form a state constitution, and finally, in 1849, a constitution which prohibited slavery was adopted, and in 1850 California was admitted as a free state under the compromises of that year. She took but little part in the Civil War. The completion of the Union Pacific Railway in 1869 placed her in closer communication with the east, and since then her development has been rapid.

California, Gulf of, an arm of the Pacific Ocean, on the west coast of North America, lying between the peninsula of Lower California and the mainland of Mexico. It is about 700 miles long, in width it varies from 70 to 150 miles, and in depth, from 600 to 6000 feet. The Colorado River is the most important stream flowing into it. Valuable pearl fisheries are found on the western shore. It was formerly known as the Sea of Cortez, having been first explored by Cortez.

California, Lower, a territory of Mexico, comprising a peninsula jutting into the Pacific Ocean and separated from the mainland throughout its entire length by the Gulf of California. Its length is more than 750 miles, its width varies from 30 to 140 miles and its area is 58,328 square miles. It is largely mountainous and arid, but it is said to possess valuable agricultural and mineral resources. The chief towns are Loretto and La Paz, the capital. Population, 42,245.

California, University of, a state university established at Berkeley, Cal., in 1868. It contains in Berkeley the colleges of letters, social science, natural science, commerce, agriculture, mechanics, mining, civil engineering and chemistry; in San Francisco, the Mark Hopkins Institute of Art, the Hastings College of Law, the medical department, post-graduate medical department, dental department and California College of Pharmacy; and on Mount Hamilton, in Santa Clara county, the astronomical department which contains the Lick Observatory. The department of anthropology was organized primarily for research and conducts excavations in Egypt, Peru and various parts of North America. The university is supported by a tax of two per cent on each one hundred dollars of assessed valuation, by certain other special state appropriations and by an income from endowment funds aggregating over three million dollars. The faculty numbers about 400 and the average attendance is 3600. The library contains 240,000 volumes. Tuition is free to residents of California. The university is especially famous for its beautiful campus and buildings, planned by M Bennard of Paris. Mrs. Phoebe R. Hearst has given millions of dollars to the institution.

Calig'ula, Gaius Caesar Augustus Germanicus (12–41), the third emperor of Rome, the youngest son of Germanicus, and the nephew of Tiberius, whom he succeeded on the throne. In the beginning of his reign he made himself very popular by his mildness and his lavish expenditures. But at the end of eight months he was seized with a disorder which permanently affected his brain, and after his recovery his career was marked by a cruelty and licentiousness little short of madness. He even considered himself a god and caused sacrifices to be offered to himself. At last a band of conspirators had him assassinated.

Ca'liph, the name assumed by the successors of Mohammed in the government of the faithful and in the high-priesthood. *Caliphate* is therefore the name given to the empire of these princes, which the Arabs founded in Asia and enlarged within a few centuries to a dominion exceeding even the Roman Empire in extent. *Shah, sultan, emir* and other titles peculiar to the East have taken the place of caliph.

Cal'isa'ya Bark, a variety of cinchona bark. See Quinine.

Cal'isthen'ics, the art or practice of exercising the body for the purpose of giving strength to the muscles and grace to the carriage. The term is usually applied to the light systematic exercises that may be performed without any apparatus, or by the use of such light apparatus as indian clubs, dumb-bells and wands.

Calixtines, *kal liks'tinz,* a sect of Hussites in Bohemia. They were so called from the Latin word *calix,* a cup, because they held that all should partake of the cup as well as of the bread, in the Lord's Supper.

Calix'tus, the name of three popes. Calixtus I was a Roman bishop from 217 to 224, when he suffered martyrdom. Calixtus II, Guido of Vienne, pope from 1119 to 1124, was a son of the count of Burgundy. In the second year of his reign he expelled the antipope Gregory VIII from Rome. In 1122 he concluded with the German emperor, Henry V, the famous Concordat of Worms. Calixtus III, Alfonso Borgia, was pope from 1455 to 1458. Though aged and feeble, he tried to institute a crusade against the Turks, but he failed. An antipope, created by Frederick Barbarossa in 1178, and calling himself Calixtus III, opposed Alexander III for nine years.

Calking, *kawk'ing,* driving a quantity of oakum into the seams of the planks in a ship's decks or sides, in order to prevent the entrance of water. After the oakum is driven very hard into these seams, it is covered with hot, melted pitch, to keep the water from rotting it. The joints of iron plates are also rendered water-tight by calking.

Cal'la, the name of two different kinds of plants, one of which, a native of South Africa, is known there as the Ethiopian lily, but among us as the calla, or calla lily. It is really not a lily at all, but it is very popular because of the beautiful pure white spathe that surrounds the small greenish flowers. The other calla is a small flower that grows in the bogs of northern Europe and America. It has large heart-shaped leaves and a white spathe. From the root a starch used as a food is produced. See Arum.

Callao, *ka lyah'o,* the chief seaport of Peru, situated on Callao Bay, 7 mi. w. of Lima. The city is divided into the old and the new towns, the latter having good streets and the conveniences of a modern city. The leading manufactures are sugar, hides, lumber and iron. Callao has one of the best harbors on the Pacific and is an important commercial port. Nearly all the exports and imports of Peru pass through it, and more than a thousand ships enter and clear from its dock each year. Population, 48,118.

Calling Hare. See Pika.

Calliope, *kal i'o pe,* one of the Muses. She presided over eloquence and heroic poetry, and is said to have been the mother of Orpheus by Apollo.

Calms, *kahmz,* Regions of, the regions in the Atlantic and Pacific oceans where there is no wind for long periods of time. The region of tropical calms lies just outside the belt of trade winds in each hemisphere. It is caused by the equal density of the warm and cool atmospheric currents in these latitudes. The region of tropical calms follows the sun in its yearly course, being farther north in summer and farther south in winter. The region of equatorial calms is at the equator, where the current is always upward. This also moves north and south with the sun. The tropical calms of the northern hemisphere are frequently known as the calms of Cancer, and those of the southern hemisphere are called the calms of Capricorn. See Horse Latitudes; Wind.

Cal'omel, mercurous chloride, a preparation of mercury much used in medicine and also found native and known by the name of horn quicksilver. It is a white, tasteless powder, practically insoluble, and is used principally as a medicine, serving as a powerful cathartic. From one-half of a grain to ten grains may be given in a dose, but overdoses produce a species of poisoning that shows itself in a swelling of the gums and an abnormal flow of saliva. Calomel is prepared by grinding sulphate of mercury in a mortar with an equal quantity of mercury, and heating the compound with common salt in a retort until the sublimation of the mercury occurs.

Calorim'eter, an apparatus for measuring absolute quantities of heat, or the specific or latent heat of bodies. Such an instrument may measure the heat given out by a body in cooling, from the quantity of ice it melts, or from the rise of temperature it produces in water around it. See Specific Heat.

Cal'trop, a military instrument with four iron points disposed in such a manner that, three of them being on the ground, the other points upward; formerly scattered on the ground to impede the progress of an enemy's cavalry. Also, the common name of the star thistle, found in waste places in the south of England. The heads are covered with long yellow spines.

CALTROP

Cal'umet, a kind of pipe used by the American indians. Its bowl was usually of soft red soapstone, and the tube was a long reed, ornamented with feathers. The calumet was used as a symbol or instrument of peace and war, its acceptance signifying agreement, its refusal, rejection of the terms.

Cal'vary, the name applied to the place outside Jerusalem where Christ was crucified, usually identified with a small eminence on the north side of the city. The term is also applied in Catholic countries to a kind of chapel, sometimes erected on a hill near a city and sometimes on the exterior of a church, as a place of devotion, in memory of the place where Jesus suffered. A rocky mound or hill on which three crosses are erected, an adjunct to religious houses, is also called Calvary.

Calve, *kal va',* Emma (Emma de Roquer) (1866–   ), a celebrated soprano vocalist, born in France. She made her début in *Faust,* in 1882, at Brussels, and thereafter sang with remarkable success in leading operatic rôles. She made her American début at New York in 1893 and has repeated the success won at that time on several later tours, both in opera and in recital.

Cal'vert, George. See Baltimore, Sir George Calvert, Lord.

Cal'vin, John (1509–1564), a famous reformer and Protestant theological writer, born at Noyon in Picardy. He went to Paris with the family of De Montmor, through whom he received an education, along with their own children, and there he gained his love for Latin, of which he became a master. Dissatisfied with the teachings of the Roman Catholic Church, he commenced the study of law in Orleans. In 1532 Calvin returned to Paris a decided convert to the Reformed faith, but he was soon compelled to leave on account of persecutions. After varied wanderings, he found a protector in Margaret of Navarre. In 1534 he returned to Paris, but in the autumn of the same year he retired to Basel, where he completed and published his great work, *The Institutes of the Christian Religion,* one of the most important documents of the Reformation period.

After traveling for a time in Italy and other southern countries, he set out for Strassburg and on his way passed through Geneva, Switzerland. There he was prevailed upon by Farel, a prominent reformer, to remain and assist in spreading the doctrines of Protestantism. With Farel he soon accomplished a remarkable change in the character of the city, both of its people and of its government. A Protestant confession of faith was adopted by the city and was made binding upon all citizens. His arbitrary rule, however, made him enemies, and he was expelled from Geneva, but his friends succeeded in effecting his recall a few years later. Thereafter he built up in the city a theocracy, with himself at its head. It directed not only the religious and political affairs, but controlled the social and individual lives of the people. This was not accomplished without some difficulty, however, and Calvin was compelled to pass through numerous serious controversies. One of these resulted, through Calvin's orders, in the arrest and execution by burning of Michael Servetus, who was passing through the city. Servetus had committed no offense, except the writing of a book attacking the mystery of the Trinity.

While acting as dictator and administrator of Geneva, Calvin found time also to maintain a correspondence through all Europe, and was consulted upon points of law and theology by leaders everywhere. Up to 1561 the Lutherans and the Calvinists were as one, but in that year the latter expressly rejected important points of the Lutheran doctrine, and the two parties thereafter separated, and at times were embroiled in controversy and even war. Calvin, however, died soon after this division, at Geneva. The essential principles of his theology are still embodied in the Presbyterian, and so-called Reformed Protestant, churches. See PRESBYTERIANS.

Cal′ycan′thus, a genus of hardy American shrubs, of which one species, Florida allspice, has yellow flowers and is sweet-scented.

Calyp′so, in Greek mythology, a nymph who inhabited an island on the shores of which Ulysses was shipwrecked. She promised Ulysses immortality if he would remain with her, and succeeded in detaining him for seven years, At the end of that time, however, she was ordered by Mercury to permit Ulysses to depart, and she aided him in preparing the raft on which he made his escape.

Ca′lyx. See FLOWERS.

Cam, in machinery, a simple contrivance for converting a uniform rotary motion into a varied sliding motion, usually a projecting part of a wheel or other revolving piece, so placed as to give an alternating or varying motion to another piece that comes in contact with it and is free to move only in a certain direction.

Cambo′dia, a country in the Indo-Chinese peninsula, comprising an area of 40,530 square miles. The greater part of it is low and flat, with numerous streams, the chief being the Mekong. The soil is very fertile, producing large quantities of rice, sugar cane and maize, and the vegetation generally is marked by tropical luxuriance. Cattle are raised in large numbers. Among the wild animals are the elephant and tiger. Gold and precious stones are found. In early times Cambodia was a powerful state, exacting tribute even from Siam, but it gradually fell into decay, and early in the nineteenth century lost a large part of its dominions to Siam. Magnificent ruins attest the former prosperity of the country. Since 1863 it has been a protectorate of France, and since 1884 practically a French colony, though nominally ruled by a king of its own. The chief town is Pnom-Penh, on an arm of the Mekong; the port is Kampot, on the Gulf of Siam. Population, estimated at 1,500,000.

Cambon, *kahN boN′*, JULES MARTIN (1845–), a French diplomat and legislator. He served in the Franco-German War and afterward was given important official positions. He was made governor general of Algeria in 1891, and from 1891 to 1902 he was French ambassador to Washington. The preliminaries of the treaty of peace which closed the Spanish-American War were negotiated by him.

Cambrai or **Cambray,** *kahN bra′*, a fortified French city, on the Scheldt, in the Department of Du Nord, 104 mi. n. e. of Paris, long celebrated for its manufactures of fine linens and lawns, whence similar fabrics are called *cambrics*. It is the seat of an archbishop and has a cathedral, an archiepiscopal palace, a townhouse and a public library. The League of Cambrai was a league formed in 1508 between Louis XII of France, the German Emperor Maximilian and Ferdinand of Spain, for the purpose of humbling the Republic of Venice. Population, 23,170.

Cam′brian Period, the oldest division of geologic time that is distinguishable by well preserved remains of animal life. The name is derived from *Cambria*, the ancient name of Wales, where the rocks formed during this period were first studied. See CAMBRIAN SYSTEM; GEOLOGY; PALEOZOIC ERA.

Cambrian System, in geology, an extensive series of sandstones, conglomerates, slates and shales, lying under the Lower Silurian beds, and above the Archaean, and divided into the Upper and Lower Cambrian. Many fossils occur in the series, including sponges, starfishes, trilobites, brachiopods, lamellibranchs, pteropods, gasteropods and cephalopods. They may be regarded as the bottom rocks of the Silurian system, and are well developed in North Wales, hence the name, but can be recognized in many other regions. See ALGONKIAN SYSTEM; SILURIAN SYSTEM.

Cambridge, *kame′brij,* MASS., a city in Middlesex co., joining Boston on the northwest, with which it is connected by four large bridges over the Charles River. It is about three miles from Harvard Square, Cambridge, to the statehouse in Boston. Several trolley lines connect the two cities, which are shortly to be connected also by subway. The principal features of interest in Cambridge are Harvard University, Radcliffe College; Craigie House, occupied by General Washington and later the home of Longfellow; Elmwood, the dwelling of James Russell Lowell; the buildings of the Protestant Episcopal Divinity School; the Shepherd Memorial Church; Christ Church; a soldiers' monument; the Howard Observatory and a botanical garden. Book printing and binding is one of the leading industries. There are also large foundries and machine shops, meat-packing houses and extensive manufactures of confectionery, soap, candles, pianos, furniture, boilers, chemicals, bricks and other articles.

Cambridge was settled in 1630 as New Town, by Governor Winthrop, and in 1683 it became Cambridge. Between 1775 and 1776 Cambridge was occupied by the American army, and Washington assumed command here in 1775 under a large elm, which is still standing. Cambridge received its city charter in 1846. Population in 1910, 104,839.

Cambridge, MD., the county-seat of Dorchester co., 60 mi. s. e. of Baltimore, on the Choptank River and the Seaford & Cambridge railroad. It is in a rich agricultural district and has an extensive oyster-canning industry, besides manufactures of underwear and lumber. The place was settled in 1684 and was early incorporated as a colonial town. Population in 1910, 6407.

Cambridge, OHIO, the county-seat of Guernsey co., 85 mi. e. of Columbus, on the Baltimore & Ohio and the Pennsylvania railroads. The region has deposits of pottery clay, natural gas, coal and iron, and the city manufactures iron and steel products, glass and pottery. Cambridge was settled in 1806. Population in 1910, 11,327.

Cambridge, UNIVERSITY OF, one of the two great English universities, as old at least as the thirteenth century, is situated at Cambridge, Eng. The university comprises twenty colleges, of which Saint Peter's College, founded in 1257, is the oldest, and Ayerst Hall, founded in 1884, is the youngest. Each of these colleges is a separate corporation and is governed by laws and usages of its own, although subject to the paramount laws of the university. The university is composed of a chancellor, a vice-chancellor, the masters or heads of colleges, fellows of colleges and students, and is incorporated as a society for the study of all the liberal arts and sciences. The senate, which is composed of all who have taken the degree of Doctor or Master, is the great legislative assembly of the university. The chief executive power is vested in the chancellor, the high steward and the vice-chancellor, who is the head of some college. Two proctors superintend the discipline of all pupils. Women who have fulfilled the conditions of residence and standing may be admitted to the examinations. Those who pass are placed in the published lists and receive certificates; but no degrees are conferred upon them. Two colleges, Girton and Newnham, have been established for women; but they are no part of the university, though many of the university lectures are open to students of these colleges. The annual income of the university was recently about $300,000, arising from various sources, including the fees at matriculation and those for degrees. The number of under-graduate students is about 3000. There are over forty professors in the various departments. A botanic garden, an anatomical school, an observatory and a valuable library containing more than 200,000 printed volumes, besides many manuscripts, are attached to the university. The new museums and laboratories for the study of science are among the most complete in the country. The university sends two members to the House of Commons. The right of election is vested in the members of the senate. See OXFORD, UNIVERSITY OF.

Cambyses, *kam bi′seez* (?–522 B. C.), a son of Cyrus the Great, became, after the death of his father, king of the Medes and Persians, 529 B. C. In the fifth year of his reign he invaded Egypt, conquering the whole kingdom within six months, but his expeditions against the Ammonites and Ethiopians failed. His violent and vindictive nature broke out in cruel treatment of his subjects, his brother Smerdis and his own wife being among his victims.

Cam′den, N. J., the county-seat of Camden co., on the Delaware River, opposite Philadelphia, Pa., and on the West Jersey & Seashore, the Atlantic City and the Pennsylvania railroads. There are numerous substantial buildings, including a theater, public, high and manual training schools, a Carnegie library, two hospitals, many notable churches, a city hall and a federal building. The city is an important shipping point and contains ship-building yards and extensive manufacturing establishments. The principal products are textile fabrics, foundry and machine shop products, chemicals and paints. The first settlement was made about 1681. The first ferry to Philadelphia was established in 1687. In 1773 Jacob Cooper laid out the present town and called it Camden. In 1828 it was chartered as a city and twenty years later it was made the county-seat. Population in 1910, 94,538.

Camden, Battles of, two battles of the American Revolution, the first fought August 16, 1780, between a force of 3000 Americans under Gates and 2000 British under Cornwallis. The latter was victorious, through strategic blunders on the part of Gates. The British loss was about 325 and the American fully 2000 in killed, wounded and captured. Among the slain was Baron Kalb. The so-called second Battle of Camden, or the Battle of Hobkirk's Hill, was fought April 25, 1781, between an American force of 1400, under Greene, and a British force of about 950, under Lord Rawdon. The British were the aggressors, leaving their position at Camden to attack the strong American works. Owing to a misunderstanding of orders the central brigade of the American force fled in confusion, and the whole army was forced to retreat with a loss of 271 against a British loss of 258.

Cam'el, a large cud-chewing animal, characterized by a long, arched neck, one or two humps on the back and a broad, fleshy pad on the sole of its foot, covering the toes. The native country of the camel is said to extend from Morocco to China, within a belt 900 or 1000 miles in breadth. The common camel, having two humps, is found in the northern part of this region exclusively, from Turkestan to China. The dromedary, or single hump camel, or Arabian camel, is found throughout the entire length of this zone, on its southern side, as far as Africa and India (See Dromedary). The Bactrian species is the larger, more robust and better fitted for carrying heavy burdens. The dromedary has been called the race horse of its species.

To people residing in the vicinity of the great deserts, the camel furnishes an invaluable means of conveyance. It will travel three days under a load, and five days under a rider, without drinking, and the stronger animals carry from 700 to 1000 pounds burden. The camel's power of enduring thirst is partly due to the peculiar structure of its stomach, to which are attached little pouches or water cells, capable of straining off and storing up water for use when journeying across the desert. It can live on little food, and that of the coarsest kind, consisting of leaves of trees and nettles, shrubs and twigs. In this it is helped by the fact that its humps are mere accumulations of fat, which form a store upon which the system can draw when the food supply is short. Hence the camel driver who is about to start on a long journey takes care to see that the humps of the animal present a full and healthy appearance. Camels which carry heavy burdens will go about 25 miles a day, those which are used for speed alone, from 60 to 90 miles.

BACTRIAN CAMEL

ARABIAN CAMEL

The camel is a rather passive animal, with much less intelligence than the horse or elephant;

but it is very vindictive when injured. It lives from 40 to 50 years. Its flesh is esteemed by the Arab, and its milk is his common food. The hair of the camel serves in the East for making cloth for tents, carpets and wearing apparel and is imported into European countries for the manufacture of fine brushes for painting, and for other purposes. The alpaca and llama are the South American representatives of the family.

Camel′lia, a genus of plants, with showy flowers and elegant dark green, shining, laurel-like leaves, nearly allied to the plants which yield tea. The camellia of Japan and China is a lofty tree of beautiful proportions, which is the origin of many double varieties of our gardens. Besides this species, one with small, white, scentless flowers, and another with large, peony-like flowers, are cultivated in America.

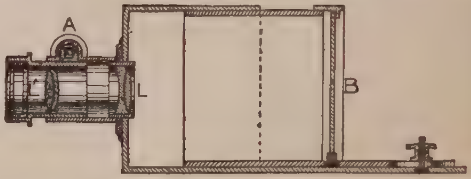
CAMELLIA

Camel′opard. See GIRAFFE.

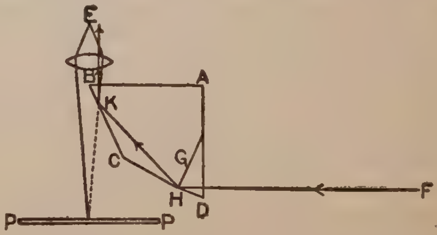
Camel's Thorn, a name of several half-shrubby plants growing in the deserts of Egypt and the East. Some of the species yield from the leaves and branches a gummy substance known as manna.

Cam′eo, the general name for all gems or stones cut in relief, that is, with raised figures, in contrast to intaglios, which are hollowed out. In a special sense a cameo is a gem composed of layers of different colors, the figures so engraved in relief that they appear in one color and the background in another. Onyx, sardonyx and agate are the stones generally used for cameos, while various kinds of shells and fine glass are used in the production of artificial cameos. The ancients were very skillful in this style of engraving, and there are still in existence many examples of wonderful workmanship, among which are some in the form of vases and dishes.

Cam′era, an instrument used by photographers in taking pictures. The necessary parts are the box, the double convex lens, *L*, and a screen, *B*. The box is telescoped so that the screen can be moved to different distances from the lens. The screen is so attached that it can be replaced by the sensitive plate upon which the negative is formed. In the best cameras the lens contains two lenses. *L* and *L′*, as by their combination a much more perfect image can be formed. *A* is the rack and pinion used in moving the lens so as to secure a perfect focus of the image upon the screen. Cameras contain many other attachments, but these are for the purpose of making the use of the camera convenient and enabling the operator to secure nice adjustments. The sides of the best cameras are made of leather and are known as the *bellows*. See PHOTOGRAPHY.



Camera Lucida, *loo′sid a*, an instrument used for sketching objects seen through a magnifying glass. It consists of a glass prism having four sides, represented by *ABCD*. The sides *AD* and *AB* are perpendicular to each other, but *CD* and *BC* are so related that a horizontal ray of light striking *CD* at *H* is reflected to *K*, from which it is again reflected to *E*, where it passes through a double-convex lens. The eye placed above *E* sees the object on the paper at *PP*,



The lens acts as a magnifying glass and enables the observer to sketch an enlarged image of the object as it appears on the paper. The camera lucida is in quite common use in laboratories for sketching minute parts of plants and animals.

Camera Obscu'ra, an instrument used for sketching landscapes and other large objects. It consists of a closed box painted black upon the inside and containing a mirror placed at an angle of 45°. Just above the mirror is a ground glass screen. The front of the camera contains a lens similar to that used in the photographic camera. When the image of the object is thrown upon the mirror, it is reflected to the screen, upon which it can be easily sketched. The camera should be used in a dark room. Before the extended use of photography, the camera obscura was very generally employed by artists in preparing illustrations for papers and periodicals. It is now but little used except as a toy.

Cam'eron, James Donald (1833–   ), an American politician known as "Don" Cameron, the son of Simon Cameron. He was born in Harrisburg, Pa., graduated at Princeton and became connected with railroads and iron manufacturing. From 1876 to 1877 he was secretary of war under President Grant and was then chosen United States senator to succeed his father. He was reëlected in 1885 and 1890.

Cameron, Simon (1799–1889), an American statesman, born in Lancaster co., Pa. He edited a newspaper in Harrisburg in 1822, supporting the candidacy of Andrew Jackson, and thus came to possess great influence in Democratic politics. He was elected to the United States Senate in 1845 and supported the Mexican War. In 1856 he joined the new Republican party and was again elected senator. He was a formidable candidate for president in the convention of 1860, but was defeated by Lincoln, who, on becoming president, appointed Cameron secretary of war. He resigned under pressure in 1862 and was sent as minister to Russia. In 1866 he again became United States senator and he held that office until 1877, when he was succeeded by his son. He was a strenuous opponent of civil service reform and long was almost absolute master of Pennsylvania politics.

Cameron, Verney Lovett (1844–1894), an English traveler and explorer. He entered the British navy in 1857, and in 1873 he was chosen to conduct an expedition for the relief of Doctor Livingstone. He was only in time to meet Livingstone's servants with his body, but he continued his journey west and was the first white man to cross central Africa from east to west. In 1878 he made a journey through Asia Minor and Persia. He published accounts of both journeys in his *Across Africa* and *Our Future Highway.*

Cameroon, *kah me roon'.* See Kamerun.

Camil'lus, Marcus Furius (?–about 365 b. c.), a Roman patrician, famous as the deliverer of Rome from the Gauls. In 396 b. c. he was made dictator during the Veientine War and captured the town of Veii by mining, after it had defied the Roman power for ten years. Two years later he besieged the Falerii and by an act of generosity induced them to surrender. In 367, after he had been appointed dictator four times, a new invasion of the Gauls called Camillus, now eighty years old, again to the front, and for the fifth and last time he defeated and dispersed the barbarians.

Camisards, *kam'i zahrdz,* the name given to the Protestant insurgents of the Cévennes, a mountainous district of southern France. The liberty of the Protestants had been taken from them by the revocation of the Edict of Nantes in 1685, and severe persecution followed. The Camisards rose in revolt against this treatment in 1702, and the French government promptly sent an army against them. The insurgents held out for three years, but were then obliged to yield, as their leaders had been killed and their strength exhausted.

Camões or **Camoens,** *ka mohNsh',* Luis de (1524–1579), the most celebrated poet of the Portuguese He became a soldier and served in the fleet which the Portuguese sent against Morocco, losing his right eye in an engagement before Ceuta. Indignant at receiving no recognition of his services, he sailed for India in 1535, but being unfavorably impressed by the life led by the ruling Portuguese there, he wrote a satire which caused his banishment to Macao. Here he wrote the earlier cantos of his great poem, the *Lusiad,* an epic poem in ten cantos. Its subject is the voyage of Vasco da Gama to the East Indies, but many other events in the history of Portugal are also introduced. Returning to Goa in 1561, he was shipwrecked and lost all his property except his precious manuscript. After much misfortune, Camoes in 1570 arrived once more in his native land, poor and without influence, as he had left it. The *Lusiad* was printed at Lisbon.

Cam'omile. See Chamomile.

Camor'ra, a well-organized secret society, once spread throughout all parts of the kingdom of Naples. At one time the members, known as Camorristi, were all-powerful, levying a kind of blackmail on all markets, fairs and public gatherings, claiming the right to settle disputes and hiring themselves out for any criminal service, from the passing of contraband goods to assassination. Though originally a secret society, the Camorra did not find it necessary under the régime of the Bourbons to conceal its operations; but under the present government of united Italy, the society, if it has not quite ceased to exist, has lost almost all its power, except in the wilder parts of southern Italy.

Campagna di Roma, *kam pah'nya de ro'mah*, the coast region of middle Italy, in which Rome is situated. It is from 30 to 40 miles wide and 100 miles long, and forms the undulating, mostly uncultivated plain which extends from near Civita Vecchia to Terracina and includes the Pontine Marshes. The district is volcanic, and its lakes, Regillus, Albano and Nemi, are evidently craters of extinct volcanoes. The soil is very fertile in the lower parts, though its cultivation is much neglected, owing to the malaria which makes residence there during midsummer very dangerous. In ancient times the Campagna, though never a salubrious district, was well cultivated and populated, the villas of the Roman aristocracy being numerous here.

Campa'nia, the ancient name of a province of Italy, in the former kingdom of Naples, which, on account of its beauty and fertility, was a favorite resort of wealthy Romans, who built there magnificent country houses. It comprises the modern provinces of Caserta, Naples, and parts of Salerno and Avellino. Cumae, the oldest Greek settlement in Italy, near which was the Lake of Avernus, celebrated in fable as the entrance to the lower regions; Puteoli; Naples; Herculaneum and Pompeii, destroyed by an eruption of Vesuvius in 79 A. D.; Baiae; Stabiae; Salernum, and Capua, its ancient capital, were the principal cities of Campania. The province is still the most beautiful and fruitful part of Italy.

Campanile, *kam pa ne'la*, a name applied to a bell tower, constituting a separate building adjacent to a church to which it belongs, and commonly used in the churches of Italy. The most famous examples are the Campanile of the Cathedral at Florence, designed by Giotto in the fourteenth century, and the Leaning Tower of Pisa, inclining thirteen feet from the perpendicular. Saint Mark's Campanile, which was 302 feet high, was an important landmark of Venice for over one thousand years, dating from 900 A. D. In 1902 it collapsed.

Campanini, *kahm pa ne'ne*, ITALO (1846-1896), an Italian tenor, born in Parma. He first discovered that he possessed a fine voice while fighting in Garibaldi's army, at the age of fourteen. Later he studied in Parma and made his début there in the opera *La Sonnambula*. Upon later tours through Europe and America he scored notable triumphs, being generally considered the greatest of operatic tenors.

Campan'ula, a large genus of herbs, with bell-shaped flowers, usually of a blue or white color. It includes several American species which are known to all lovers of wild flowers. The harebell flower found in all the states on damp rocks and rocky hillsides, is an exceedingly pretty and delicate plant. The Canterbury bell is a European species, with large tubular flowers, formerly popular in gardens.

Campbell, *kam'b'l*, ALEXANDER (1788-1866), an American theologian, born in Ballymina, Ireland. He came to America in 1807 and was for a time in the ministry of the Presbyterian church. But accepting ardently the views of his father, Thomas Campbell, as set forth in the "Declaration and Address," calling for larger unity among divided churches, he began to agitate the question of larger union among Christian bodies upon the foundation of New Testament teaching without other creeds or formulations. This led presently to the organization of the body of people known as Disciples of Christ, or the Christian Church, known in some communities at one time as Campbellites. He founded Bethany College in West Virginia, of which he was president until his death. He was the editor of the *Christian Baptist* and later of the *Millennial Harbinger*.

Campbell, SIR COLIN, Lord Clyde (1792-1863), a famous British soldier, born in Glasgow. He was educated at the high school at Glasgow and afterward at the military academy at Gosport, and in 1808 he received an ensign's commission in the Ninth Regiment of Foot. He served in Spain under Sir John Moore and Wellington, had a part in the expedition to the United States in 1814 and from 1819 to 1825 was in the West Indies. In 1842 he was in China, and on the termination of the Chinese War he saw active service in India. On the outbreak of the Crimean War he became major general, with the command of the Highland

Brigade, and took a prominent part in repulsing the Russians at Balaklava. He was appointed to the first command at the outbreak of the Indian mutiny, relieved Havelock and Outram at Lucknow and crushed the rebellion entirely before the end of the year. He was created a peer, with the title of Baron Clyde, aad had a large income allotted him. In 1862 he was made field marshal. He was buried in Westminster Abbey.

Campbell, John Archibald (1811–1889), an American jurist, born in Georgia. He graduated at the University of Georgia in 1826, practiced law in Alabama and was a member of the legislature of that state. President Pierce made him an associate justice of the United States Supreme Court in 1853. He resigned in 1861 to become assistant secretary of war of the Confederacy, and resumed the practice of law after the war.

Campbell, Thomas (1777–1844), a noted English poet. After leaving Glasgow University, where he had won a reputation by his poetical translations from the Greek, he lived for a short time in Edinburgh. He rose suddenly to fame on the publication, in 1799, of his *Pleasures of Hope*. In 1803, after spending some time in Germany, Campbell published an edition of the *Pleasures of Hope* with the addition of the lyrics *Hohenlinden*, *Ye Mariners of England* and *The Exile of Erin*. In 1809 he published *Gertrude of Wyoming* and *The Battle of the Baltic*. In 1820 he became editor of the *New Monthly Magazine*, a position which he held for ten years. He took an active part in the foundation of London University, and in 1827 he was elected rector of Glasgow University. He died at Boulogne and was interred in the Poets' Corner, Westminster Abbey.

Campbell-Ban'nerman, Sir Henry (1836–1908), a British statesman. He is a Campbell, and the additional name of Bannerman was added under the terms of the will of a maternal uncle. He entered Parliament as a member for Stirling district, Scotland, in 1868 and has represented that district ever since. Throughout Gladstone's career, Campbell-Bannerman was loyal to him and served as secretary for war in Gladstone's administrations of 1886 and 1892. He has also served as secretary to the admiralty and chief secretary for Ireland. In 1899 he became the Liberal leader of the House of Commons, and in 1905 he succeeded Balfour as premier. Although his career was not brilliant, he proved himself possessed of many of the best qualities of leadership. Personally he was exceedingly popular.

Campeachy or **Campeche,** *kam pe'chee*, a seaport of Mexico, situated on the west coast of the peninsula of Yucatan, at the mouth of the San Francisco River. Shipbuilding and the manufacture of cigars are the chief industries. A considerable trade in campeachy wood and wax is maintained, but the harbor is shallow and can be entered only by vessels of light draught. Population, 17,000.

Campeche, Gulf of, the name given to the part of the Gulf of Mexico which is south of latitude 21° north.

Camphine, *kam feen'*, the commercial term for purified oil of turpentine, obtained by distilling the oil over quicklime to free it from resin. It is used in lamps and gives a very brilliant light; but to prevent smoking, the lamp must have a very strong draught. With oxygen, camphine forms camphor.

Camphor, *kam'fur*, a whitish, translucent gum, with a bitterish, aromatic taste and a strong characteristic smell. The common camphor of the shops is obtained from a laurel, a native of China and Japan, now naturalized in many

BRANCH OF CAMPHOR TREE

other countries. Camphor is prepared chiefly in the island of Formosa, though it is also exported from Japan and to a small extent from China. *Borneo camphor* is the product of a tree 100 to 130 feet high, found in Borneo and Sumatra. It is not procured by distillation, but is found in masses, secreted naturally in cavities in the trunk and greater branches. Numerous other vegetables, such as thyme, rosemary and sage, are found to yield camphor by distillation. In medicine, camphor is used both as an external and internal stimulant. In small doses it relieves pain; in large doses it acts as a poison. Its odor being obnoxious to insects, it is much used to protect specimens in natural history. It evaporates or volatilizes at ordinary temperatures.

Cam′pobel′lo, an island in the Bay of Fundy. It is 8 miles long, belongs to New Brunswick, Canada, and has a famous lighthouse on its northern extremity. The island is well wooded with fir and larch. Population, about 1200.

Campo-Formio, *kahm′po for′myo*, a town in Italy, 66 mi. n. e. of Venice, famous for the treaty of peace between Austria and France, which was signed in its neighborhood on Oct. 17, 1797. Its chief provisions were that Austria should cede the Belgian provinces and Lombardy to France, receiving in compensation the Venetian states.

Campos, *kahm′posh*, Arsene Martinez (1834–1900), a Spanish statesman and general. He served in Africa and in Mexico and in 1869 joined the army of Cuba. After his return to Spain he refused to recognize the republic which was proclaimed on the abdication of Amadeus, and was imprisoned. Released in the following year, he headed a movement for the restoration of Alfonso XII, the son of the deposed Isabella, to the throne. His success in this insurrection won him the highest rank in the army. After putting down the insurgents in Cuba in 1878, he returned to Spain, where he advocated a just policy toward Cuba. In 1895, when the new insurrection arose in Cuba, he was sent to put down the insurgents, but was recalled in a short time, as his methods did not find favor with the Spanish government.

Campo Santo, *kahm′po sahn′to*, (holy field), the Italian name for a burying ground, used especially to designate the more remarkable of these places, those which are surrounded with arcades and are richly adorned. The most famous Campo Santo is that of Pisa, which dates from the twelfth century, and which has on its walls frescoes of the fourteenth century of great interest in the history of art.

Campus Martius, *kam′pus mar′shus*, a large open space in the suburbs of ancient Rome, consisting of the level ground between the Quirinal, Capitoline and Pincian hills and the River Tiber, set apart for military exercises and sacred to the god Mars. In the latter period of the Republic it was a suburban pleasure ground for the Romans, and it was laid out with gardens, shady walks, baths and theaters. The site is now occupied by a thickly-settled portion of the modern business city.

Cam′wood, a red dyewood, imported from tropical West Africa and obtained from a leguminous tree. This wood is of a very fine color and is used in turning for making knife handles and other similar articles. The dye obtained from it is brilliant, but not permanent. It is called sometimes *barwood*, though this name belongs to another tree.

Ca′na, a village of Palestine in Galilee, the scene of Christ's first miracle, probably represented by Kana-el-Jelil, a modern village nine miles north of Nazareth, containing ancient ruins.

Canaan, *ka′nan*. See Palestine.

Ca′naanites, in general, the name given to the heathen nations found dwelling in Palestine west of the Jordan. At the time of the Israelitish invasion these different nations were the Hittites, Jebusites, Hivites and Amorites. It is not to be inferred from the collective name applied to them that all these peoples were the descendants of Canaan. On the contrary, their origin can be traced to a number of different sources.

The Canaanites were gradually subdued by the Israelites, but in Solomon's time all paid tribute. In language, government, morals and religion these people were different from the Israelites, the principal feature of their religion being the worship of Baal and Asherah, his consort, who was called "the happy." The symbol of Asherah was the stem of a tree, though this was sometimes carved into an image. The symbol of Baal was probably a cone, and represented the rays of the sun. It was undoubtedly the mingling of these symbols in large numbers which constituted the groves of Baal, so frequently mentioned in the historic books of the Old Testament. The immoral practices connected with the worship of Asherah were particularly obnoxious to the Hebrews.

Can′ada, Dominion of, the largest and most important British colony, occupying all of

North America north of the United States, except Alaska. It is bounded on the n. by the Arctic Ocean, on the e. by Baffin's Bay, Davis Strait and the Atlantic Ocean, on the s. by the United States and on the w. by the Pacific Ocean and Alaska. Its greatest length from east to west is 2700 miles, and from north to south, 1600 miles. Its area is 3,745,574 square miles, one-sixth of which is water. Canada is larger than the United States and nearly as large as the continent of Europe.

SURFACE AND DRAINAGE. In respect to surface, Canada can be divided into three great regions: the eastern highlands, the central plain and the western or Rocky Mountain highlands. The eastern highland region extends from the Atlantic coast westward to the southern extremity of Hudson Bay. It is characterized by ranges of low mountains and hills and approximately level plains. The highest land is found on the coast of Labrador, where some of the peaks reach up to 8000 feet. The Laurentian Mountains, north of the Saint Lawrence River and nearly parallel with it, in some places attain a height of about 4000 feet. Detached summits or buttes from this range are found westward as far as Montreal, the mountain of Montreal being one of these peaks, and to the south of the river and a little east of this several others rise. Extending westward from the eastern highland region is the great central plain of Canada, which is a continuation northward of the plain in the United States. Along the international boundary this is about 700 miles wide and terminates in the foothills of the Rocky Mountains, which form a part of the boundary between Alberta and British Columbia. Extending northward, this plain includes the northeastern corner of British Columbia, and then its western boundary follows the Rocky Mountains between Mackenzie and Yukon. The Rocky Mountain highlands begin with the foothills of the Rocky Mountains in Alberta and extend westward to the coast. This region embraces the provinces of British Columbia and Yukon, and the southern part of it is broken by numerous ranges of the Rockies and coast ranges. See BRITISH COLUMBIA, subhead *Surface and Drainage.*

About 250 miles north of the Saint Lawrence River and running parallel with it as far as Ontario, is a low ridge, known as the Height of Land, separating the waters of the Saint Lawrence basin from those flowing into the eastern side of Hudson Bay. After entering Ontario this height of land continues westward north of the Great Lakes until it reaches a point a little west of Lake Nipigon, when it bends southward and extends diagonally across Minnesota to the headwaters of the Red River of the North. From here it bends to the northwest, and after traversing Dakota in an irregular line, reënters the Dominion at the northwestern corner of this state. It then extends westward near the international boundary until it reaches the Rocky Mountains. Another similar divide starts in Alberta a little north of Edmonton and extends northeasterly through that province and across Saskatchewan nearly to the eastern boundary, when it bends to the north and northwest and extends through Mackenzie to Lake Aylmer, thence northeasterly to Melville Peninsula. This divide separates the waters flowing into Hudson Bay on the west from those finding an outlet in the Arctic Ocean through the Backs, Coppermine and Mackenzie rivers.

The Saint Lawrence, with its tributaries, is the largest and most important river system. Its basin includes the Great Lakes, nearly one-half of which belong to Canada. From the north the important tributaries are the Saguenay, the Saint Maurice and the Ottawa, while the most important tributaries from the south are the Richelieu and the Saint Francis. The northern part, or the region between James Bay and the Atlantic Ocean, is low and contains a number of lakes. All of the central plain south and east of the watershed crossing Alberta is drained into Hudson Bay. The important rivers are the Saskatchewan and its outlet, the Nelson, and the Churchill. The most important lake in this region is Lake Winnipeg. To the north and west of the watershed we find the Athabasca, Mackenzie, Coppermine and Backs rivers, which furnish drainage for the northern part of Alberta, Saskatchewan and nearly all of the great province of Mackenzie. In the northern part of this region are numerous large lakes, the most noted being Athabasca, Great Slave Lake and Great Bear Lake. West of the main range of the Rocky Mountains the principal rivers are the Columbia, the Frazer, the Skeena and the Stikine. See BRITISH COLUMBIA, subhead *Surface and Drainage.*

CLIMATE. In latitude Canada extends from near the 40th parallel to the North Pole, and its great extent from north to south, as well as the varied local conditions between the Atlantic and Pacific coasts, gives the Dominion a great variety of climate. The cold currents in the Atlantic which flow along the coasts of Labrador and

Newfoundland impart to this region a cold, damp climate; hence the provinces of Nova Scotia, New Brunswick, Quebec and Ungava have severe winters, frequently accompanied by great depths of snow, and short, hot summers. While the rainfall in this region is not heavy, it is everywhere sufficient for agriculture. The southern portion of Ontario, on account of its proximity to the lakes, has a much more equable climate, but in the northern portion and in the heart of the continent, occupied mostly by Manitoba, Saskatchewan and Keewatin, the extremes of an interior continental climate are manifest. In Manitoba the summers are hot, while during winter the thermometer often descends to 50° below zero. However, the dry atmosphere of this region mitigates the severity of the cold. To the westward and along the eastern slope of the Rocky Mountains, the climate is much more salubrious, owing to the Chinook winds, which modify the severity of the winter (See CHINOOK), while to the west of the principal mountain range British Columbia, owing to the influence of the warm winds from the Pacific, has a comparatively mild climate throughout the year (See BRITISH COLUMBIA, subhead *Climate*). The northern provinces, Yukon, Mackenzie and Franklin, have an arctic climate. With the exception of a few areas in the center of the great plain, all portions of the Dominion have ample rainfall.

For vegetation and animals, see NORTH AMERICA, subheads *Vegetation* and *Animal Life*.

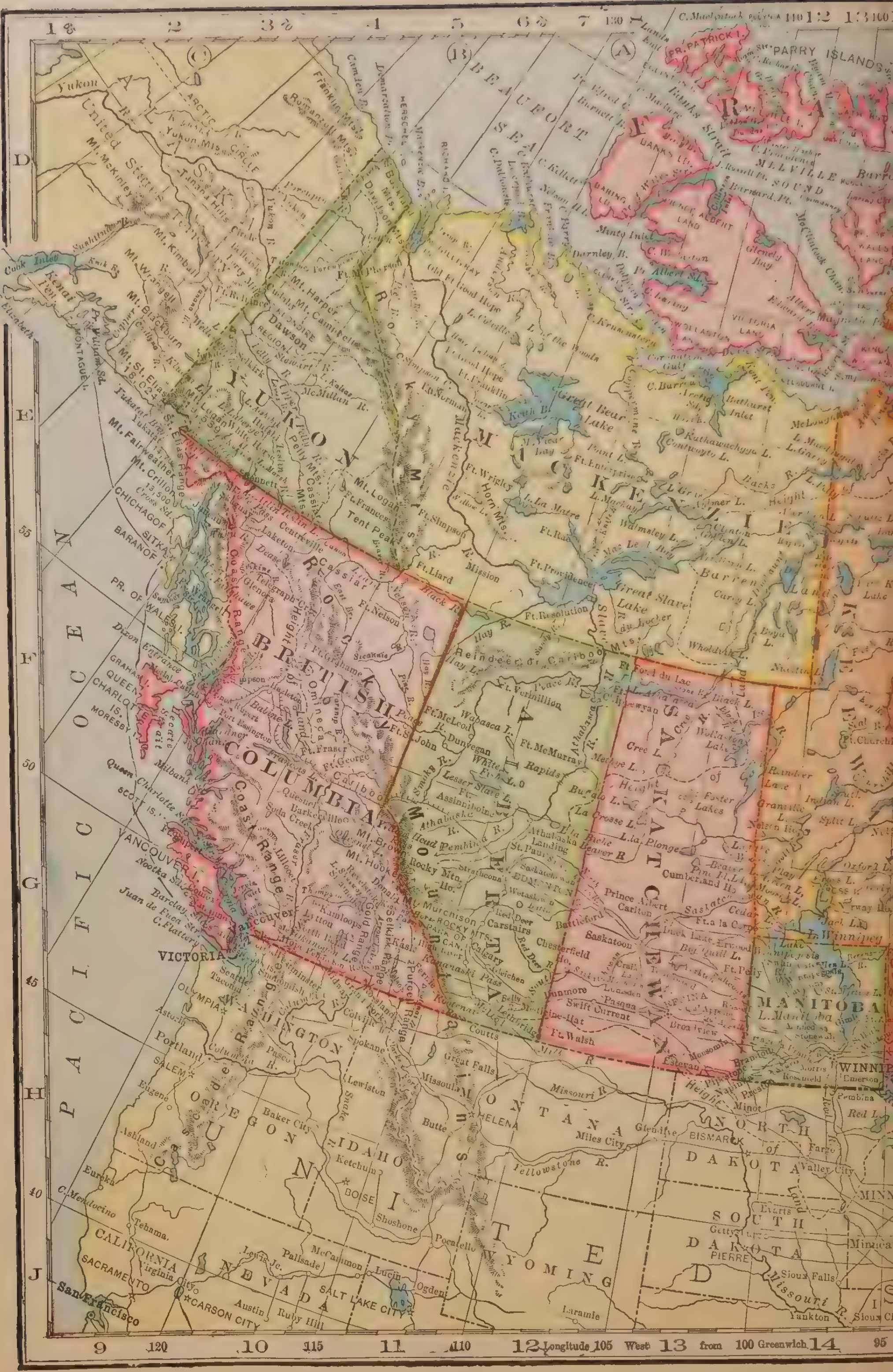
MINERAL RESOURCES. Canada is abundantly supplied with valuable minerals. Iron of excellent quality is found in abundance in Quebec, Ontario and British Columbia. The district around Lake Superior and Lake Huron has valuable deposits of copper and some silver. Nova Scotia contains some of the richest coal fields in North America, and on Vancouver Island in British Columbia are valuable mines of bituminous coal, while in Alberta and Saskatchewan are found large areas of lignite of good quality. The area of the entire coal measures of Canada is estimated at about 100,000 square miles. Gold has been found in nearly all provinces, but it occurs in paying quantities only in Yukon and British Columbia, where gold mining has become an important and extended industry (See BRITISH COLUMBIA; YUKON, subhead *Mineral Resources*). In Ontario occur nickel mines, which produce nearly one-half of the world's output of this metal. Petroleum and salt are also found in the peninsula between Lakes Erie and Ontario, and there are valuable quarries of asbestos and building stone, the latter being widely distributed through the Dominion.

AGRICULTURE. The extreme northern part of the Dominion is too cold to admit of cultivating the soil, but the soil and climate of the southern provinces, and of nearly all of the vast interior and of the valleys in British Columbia, are well adapted to tillage. Agriculture is the leading industry of Canada, and seven-tenths of the people are engaged in some sort of agricultural occupation. Each province is especially adapted by soil and climatic conditions to certain lines of agriculture, and in every case those occupations which are best adapted to each locality constitute its chief industries. The great interior is being rapidly developed, and it constitutes one of the greatest wheat regions in the world. In general, the important crops are wheat, potatoes, oats, barley, peas, beans, beets, and, in some locations, tobacco. Cattle, horses and sheep are raised in large numbers, and dairying has become a very important industry, Canada ranking as the first country in the world as an exporter of cheese. For detailed description of Canadian agriculture, see articles under the different provinces.

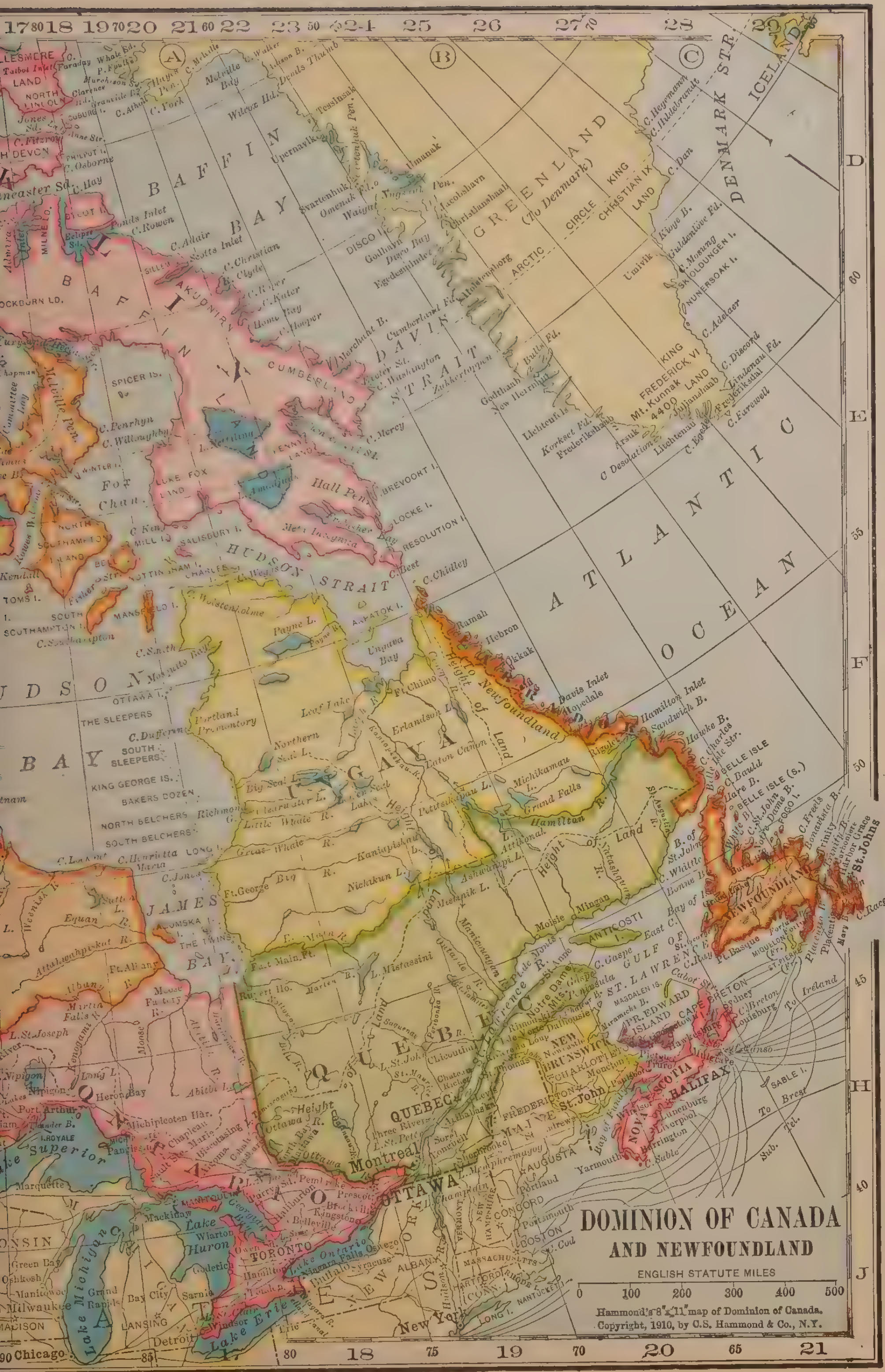
LUMBERING. Canada has a more extensive forest area than any other lumber-producing country in the world. Beginning with the eastern highland region, this extends in an unbroken line entirely across the continent south of Hudson Bay. It varies in width from 200 to 300 miles. It contains large quantities of spruce, pine, hemlock, balsam and hard woods in the eastern portion; quantities of white pine in the central and the Douglas fir in the western. Lumbering is one of the most important industries, especially in Quebec, Ontario and British Columbia. Much of the product finds a market in the United States.

FISHERIES. The fisheries of Canada furnish an important industry and are among the most valuable in the world. The most extensive fisheries are along the Atlantic coast, and the inhabitants of the maritime provinces—Prince Edward Island, Nova Scotia and New Brunswick—are extensively engaged in this industry. In British Columbia the taking and canning of salmon is second in importance only to the cod fisheries of the Atlantic coast.

MANUFACTURES. The Dominion has an abundance of raw material, and in those provinces where fuel is plenty and convenient there are many inducements to the upbuilding of manufacturing industries. However, manufac-



BEAUFORT SEA
PACIFIC OCEAN
ALASKA
United States Territory
YUKON
MACKENZIE
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
WASHINGTON
OREGON
IDAHO
MONTANA
WYOMING
NEVADA
CALIFORNIA
NORTH DAKOTA
SOUTH DAKOTA
UNITED STATES
ROCKY MTS.
Yukon
Yukon R.
ARCTIC CIRCLE
Mt. McKinley
Tanana Hills
Mt. Kimball
Mt. Wrangell
Mt. Blackburn
Mt. St. Elias 18,024
Mt. Logan 19,539
Mt. Fairweather
Mt. Crillon
Cook Inlet
Kenai Pen.
C. Elizabeth
MONTAGUE I.
Yakutat B.
CHICHAGOF I.
BARANOF I.
SITKA
PR. OF WALES I.
Dixon Entrance
QUEEN CHARLOTTE IS.
GRAHAM I.
MORESBY I.
Queen Charlotte Sd.
SCOTT IS.
VANCOUVER I.
Nootka Sd.
Barclay Sd.
Juan de Fuca Str.
C. Flattery
VICTORIA
Vancouver
Seattle
Tacoma
OLYMPIA
Astoria
Portland
SALEM
Eugene
Ashland
Eureka
C. Mendocino
Tehama
SACRAMENTO
San Francisco
CARSON CITY
Virginia City
Austin
Ruby Hill
SALT LAKE CITY
Ogden
Lucin
McCammon
Pocatello
BOISE
Ketchum
Shoshone
Baker City
Lewiston
Spokane
Colville R.
Missoula
Butte
HELENA
Great Falls
Miles City
Yellowstone R.
Missouri R.
Laramie
Glendive
BISMARCK
Minot
Fargo
Valley City
PIERRE
Gettysburg
Sioux Falls
Yankton
WINNIPEG
Emerson
Pembina
Red R.
L. Winnipeg
L. Manitoba
Dawson
Klondike Region
Selkirk
Ft. Selkirk
Mt. Harper
Mt. Campbell
Stewart R.
McMillan R.
Pelly R.
Pelly Mts.
Cassiar Mts.
Mt. Logan
Ft. Frances
Tent Peak
Ft. McPherson
Peel R.
Porcupine R.
Mackenzie R.
Ft. Norman
Ft. Good Hope
Ft. Wrigley
Ft. Simpson
Ft. Liard
Ft. Providence
Ft. Rae
Ft. Resolution
Great Bear Lake
Great Slave Lake
Coppermine R.
Barren Lands
Ft. Chipewyan
Ft. Vermillion
Peace R.
Athabasca L.
Ft. McMurray
Lesser Slave L.
Ft. St. John
Dunvegan
Ft. McLeod
Ft. George
Ft. Fraser
Cariboo
Barkerville
Quesnel
Soda Creek
Kamloops
Lytton
Lillooet
Coast Range
Selkirk Range
Gold Range
Kaslo
Rossland
Nelson
Mt. Brown
Mt. Hooker
Mt. Murchison
Donald
ROCKY MTS. PARK OF CAN.
Banff
Calgary
Carstairs
Red Deer
Edmonton
Strathcona
Athabaska Landing
St. Paul
Battleford
Prince Albert
Carlton
Saskatoon
Chesterfield
Dunmore
Medicine Hat
Swift Current
Ft. Walsh
Coutts
Lethbridge
Macleod
Regina
Moose Jaw
Broadview
Estevan
Brandon
Cumberland Ho.
Ft. la Corne
Ft. Pelly
Cree L.
La Crosse L.
Reindeer Lake
Nelson House
Split L.
Oxford L.
Norway House
Ft. Churchill
BANKS LD.
PR. PATRICK I.
PARRY ISLANDS
MELVILLE SOUND
VICTORIA LAND
PR. ALBERT LAND
WOLLASTON LAND
Coronation Gulf
C. Krusenstern
C. Bathurst
C. Dalhousie
Franklin Mts.
Romanzoff Mts.
Camden B.
Horn Mts.
Liard R.
Stikine R.
Telegraph Cr.
Omineca
Fraser R.
Columbia R.
Snake R.
Longitude 105 West from 100 Greenwich
1 2 3 4 5 6 7 8 9 10 11 12 13 14
A B C D E F G H J
130 120 115 110 105 100 95
40 45 50 55



DOMINION OF CANADA
AND NEWFOUNDLAND

ENGLISH STATUTE MILES

0 100 200 300 400 500

Hammond's 8"x11" map of Dominion of Canada.
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turing has developed later than almost any other industry of the Dominion, largely because other industries yielded good products, and manufactured goods could be obtained from the United States and Great Britain at less expense than they could be produced at home. With the development of the country, however, manufactures have multiplied. The leading industries, aside from the manufacture of lumber, are the manufactures of furniture, finishings for interiors, wood pulp, leather, boots and shoes, and in Quebec and Ontario, cotton and woolen goods. Nova Scotia and some other provinces have smelting works and foundries.

TRANSPORTATION AND COMMERCE. The Saint Lawrence River and its system of canals furnish a waterway into the interior of the country (See SAULT SAINTE MARIE CANAL; WELLAND CANAL). The Grand Trunk, Canadian Pacific and Intercolonial railways, with connecting lines, furnish the eastern and central provinces with ample railway facilities. The Canadian Pacific, extending from Montreal to Vancouver, forms a trunk line across the continent. This makes connection with lines from the United States at Sault Sainte Marie, Winnipeg and several other places of lesser importance. In all, the Dominion has over 18,000 miles of railway. The Grand Trunk Pacific, the construction of which has been guaranteed by the Dominion government, will, when completed, make another transcontinental line, extending from Winnipeg, across Saskatchewan, Alberta and British Columbia, to the Pacific, and northward through Yukon to Dawson, in the Klondike region. This will furnish an outlet for a large area of country well adapted to agriculture and stock raising. Canada has excellent mail facilities and ample telegraph and telephone lines for the needs of her population. The commerce is extensive. About four-fifths of the exports are sent to the United States and Great Britain, and nine-tenths of the imports are received from these countries. The leading exports are lumber, live stock, agricultural products, dairy products, fish, coal and other minerals, leather, wood pulp and wooden manufactures. The imports consist of manufactured goods, coal, iron, tea, coffee, sugar and cotton and woolen fabrics. The money system is similar to that of the United States, the dollar of one hundred cents being the unit.

GOVERNMENT AND RELIGION. The Dominion of Canada is a federation of states technically known as provinces. These, with their areas in square miles, are given in the following table:

Alberta	253,540
British Columbia	312,630
Franklin	500,000
Keewatin	516,571
Mackenzie	562,182
Manitoba	73,732
New Brunswick	27,985
Nova Scotia	21,248
Ontario	260,862
Prince Edward's Island	2,184
Quebec	351,873
Saskatchewan	250,650
Ungava	354,961
Yukon	196,976

The chief executive of the Dominion is a governor general, appointed by the king of England. He is assisted by a council, consisting of a prime minister and twelve other ministers, heads of departments. The legislative authority rests with a Parliament, consisting of two houses, the Senate and the House of Commons. The Senate consists of members who are nominated by the governor general and hold their positions for life. Each senator must be a born or naturalized subject, thirty years of age, and possessed of real or personal property to the value of at least $4000 in the province for which he is appointed. The House of Commons consists of members elected by the people for five years and apportioned among the provinces according to population. The franchise is uniform, a vote being given to every male citizen twenty-one years of age and possessed of a small property qualification. The Dominion government enacts all criminal law, establishes and maintains the penitentiaries and also enacts all laws relating to bankruptcy, solvency, marriage and divorce, naturalization, aliens and indians, and in general legislates upon all subjects not expressly assigned to the provincial legislatures. Each province has a separate parliament and is independent in all local matters. The provincial parliaments are chosen by popular suffrage, and the executive head of each province is a lieutenant governor appointed by the national government. Ontario, Manitoba and British Columbia have legislative assemblies of one chamber, while the other provinces have two chambers.

The administration of justice is based on the English system, except in the province of Quebec, where the old French law prevails. Judges of the provincial courts are provided by the general government and serve for life or during good behavior, but in the case of the province of Quebec they must be selected from the bar of that province. Each province has its lower courts, which have jurisdiction within the county, and also a supreme court, whose jurisdiction extends over the province. The courts having jurisdiction throughout the Dominion are the exchequer, the marine court and the supreme court, which is the ultimate court of appeal in civil and criminal cases. Under certain conditions cases may be appealed to the king's privy council.

There is no State Church, and all religious beliefs are tolerated. In the province of Quebec the Roman Catholic faith predominates. In the other provinces the inhabitants are divided between the Church of England and the various evangelical denominations, Methodists, Presbyterians, Baptists and Congregationalists.

EDUCATION. Each province manages its own educational affairs, on a plan somewhat similar to that in vogue in the various states of the Union. There is a Dominion minister of education, who has general oversight over the public schools. For a fuller description of the educational system, see the subhead *Education*, in the articles treating of the different provinces.

CITIES. The chief cities are Ottawa, the capital, Montreal, Toronto, Quebec, Halifax, Saint John's and Vancouver, each of which is described under its title.

HISTORY. The Sagas of Iceland tell of the voyages of the Vikings, Eric and Leif, to the shores of North America, and it was by them, probably, that Canada was first visited. These ventures, however, amounted to nothing, and John Cabot made in 1497 the first real discovery of the North American continent. He planted on the shores of Newfoundland the standard of England, and it was on this that Great Britain based her claim to America. Within twenty years after Cabot's visit, fishermen—English, Basque and Breton—began to visit the cod banks in great numbers. The French explorers entered Canada early in the sixteenth century, and the energy and good fortune of the French allowed them for a time to outstrip the British in the newly found territory. Jacques Cartier, the greatest of these early explorers, sailed three times to the New World between 1534 and 1542 and spent the winter of 1535–1536 on the site of Quebec. De la Roque, Sieur de Roberval, made an attempt to found a colony at Cape Rouge in 1541, but his attempt failed utterly. For fifty years from this time France paid little attention to Canada, although French fishermen still frequented the cod banks. The English, however, had by no means forgotten it. In 1583 the first attempt at an English settlement was made by Sir Humphrey Gilbert, but his colony at Saint John's, Newfoundland, was short-lived. The first permanent settlement in Canada was made at Quebec in 1608 by Champlain and a few years later a temporary settlement was made at Montreal. It was by Champlain, too, that the first alliance was made with the Hurons and Algonquins, which led later to the conflicts with the Iroquois. Quebec rapidly became the center of the fur trade, upon which the prosperity of New France—as French territory in Canada was called—was based from first to last.

Richelieu in 1627 organized the Company of New France, which held sway in Canada until 1663 and possessed the monopoly of the fur trade. Meanwhile, the Jesuits had appeared in Canada, and for many years they exercised the most powerful influence over civil affairs there. When Colbert came to power in France under Louis XIV, the treatment of Canada by France was bettered somewhat, because he realized the value of the colony to the mother country. The fur trade was regulated by new rules, and women were taken to the colony from France as wives for the colonists. In 1672 Frontenac was made governor of New France, and it was under his rule that La Salle explored the upper Mississippi and that military posts were established at Niagara, Mackinac and in the Illinois territory.

There had been, as early as 1629, clashes between the French and English in Canada, but it was not until the outbreak, in 1689, of the first of the so-called French and Indian Wars, that the real contest between the French and English for supremacy in North America began (See FRENCH AND INDIAN WARS). In 1763, by the Treaty of Paris, France ceded to Great Britain Canada and all the territory east of the Mississippi, except the city and district of New Orleans, and renounced all claims to Acadia.

For some years subsequent to this time, the Canadians, who had been harassed for so long by war, had a period of rest. The French in Canada found that their affairs were as well looked after under the new, as under the old, government, and that they were to be allowed the practice of their religion, and very few of them left Canada. From 1760 to 1764 the country was under military government, and for the ten years following 1764 it was under a pro-

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visional government which consisted of a governor general, assisted by an executive council. In 1774 the Quebec Act was passed, which united to Canada the Great Lake territory, allowed Roman Catholics the free exercise of their religion and vested the rule of the territory in a governor and a legislative council appointed by the crown.

Shortly after the passage of this act occurred the outbreak of the American Revolution. This was an important crisis in the history of Canada. Emphatic appeals were made to the Canadian French to join the American colonies in their rebellion; the country was invaded and seemed for a time destined to come under the control of the thirteen colonies. The province remained loyal to England throughout, however, and the restoration of peace in 1783 brought to it a distinct gain in the emigration from the United States to Canada of over thirty thousand American loyalists. These new inhabitants proved to be among the foremost of the real makers of Canada. The area of Canada, however, was decreased by the Treaty of 1783, as the territory which forms Michigan, Wisconsin, Ohio, Indiana and Illinois was ceded to the United States. In 1791, by the Constitutional Act, Canada was divided into two provinces, Upper Canada and Lower Canada. Lower Canada had at this time a population of perhaps one hundred twenty-five thousand, most of whom were of French descent, while Upper Canada had a population of twenty thousand, who were almost entirely English. Each division was given a government of three branches: a legislative council to be appointed by the king, an assembly chosen by popular vote and a governor and executive council to be appointed by the king. English laws and institutions were not imposed on the French provinces. New Brunswick, Nova Scotia, Cape Breton and Prince Edward Island were given administrations similar to those of the other two provinces.

The Constitutional Act by no means settled the difficulties in Canada, as from the first much dissatisfaction was felt in both provinces. The War of 1812 between England and the United States drew them together somewhat and united them for a time more firmly to the mother country, but after the close of the struggle the dissatisfaction again became apparent. In 1837 both Upper and Lower Canada were disturbed by an insurrection, and in 1840 it became plain to the British government that the wisest policy was to reunite them. In 1840, therefore, the act to reunite the provinces of Upper and Lower Canada became a law. Provision was made under the new constitution for a legislative council, whose members were to be appointed for life by the governor; for a legislative assembly, to consist of an equal number of members from Upper and Lower Canada; for a governor, to be appointed by the crown, and for an executive council, to be chosen by the governor from the legislative council and the legislative assembly. By an act of the British Parliament in 1867, New Brunswick, Nova Scotia and Upper and Lower Canada were formally joined into one Dominion of Canada, and British Columbia and Prince Edward Island were added later. The legislature of Newfoundland decided in favor of joining the dominion, but the popular vote was against the union, and Newfoundland remained separate. The vast territory of the Hudson Bay Company was purchased by the Dominion in 1869, and in 1884 this led to an insurrection of colonists and natives under Louis Riel. The insurrection was put down, and the great so-called Northwestern Territory was afterward divided into Keewatin, Mackenzie, Yukon, Assiniboia, Saskatchewan, Alberta and Athabasca. These last four districts were in 1905 united into two, Alberta and Saskatchewan.

Population. The population consists of English, French and immigrants from Germany and the United States. In the province of Quebec most of the people are of French descent, and in many localities in that province the French language prevails. Elsewhere English is universally spoken. Population, in 1901, 5,369,666, of whom about 130,000 were indians.

Canada Balsam, *bawl'sam,* a resinous substance obtained from the balsam fir, common in Canada and the United States, and also from Fraser's balsam fir and the hemlock spruce. It is used in medicine and in making varnishes, and because of its almost perfect transparency, in the preparation of objects for the microscope.

Canada Goose, an American wild goose, common in temperate North America. It is from thirty to thirty-five inches long, is brownish above and lighter below, with head, neck, bill and feet black and with a white patch over each cheek. In early spring Canada geese may be seen flying north at a considerable distance above the earth in a > shaped flock. At their head is a leader, an old gander, who directs the flight, and the others following may often be heard giving their loud, coarse "honk" as they fly past. They breed in the north, and when the frosts come they migrate again to the south.

Canada Hemp, a perennial herb of the dogbane family, native of North America. It has a strong fiber, used by the indians for making twine, nets and various woven fabrics.

Canada Thistle, one of the most common and injurious of all weeds. It grows in the United States from New England to the middle west and propagates itself by seeds and by its creeping roots. It bears purplish flowers about three-quarters of an inch in diameter. This weed grows very freely in large open fields and among various kinds of grains. To prevent the growth of the Canada thistle, diligent cultivation of the land and alternate sowing of heavy, hardy crops are necessary.

CANADA THISTLE

Cana'dian River, a river that rises in the northeastern part of New Mexico and flows easterly through Texas and Oklahoma and unites with the Arkansas at Tamaha. It forms a part of the former boundary between Oklahoma and Indian Territory. The quantity of water it carries varies greatly at different seasons. Its length is 900 miles. It is the most important tributary of the Arkansas.

Canal', an artificial watercourse for the transportation of goods or passengers by boats or ships, or for purposes of drainage or irrigation (See DRAINAGE CANAL, CHICAGO; IRRIGATION). This article treats of canals for navigation. Probably the first canals were constructed for the purposes of irrigation, and there is a tradition that the Egyptians constructed a canal across the Isthmus of Suez before 2000 B. C. About 600 B. C. Nebuchadnezzar opened the royal canal between the Tigris and the Euphrates rivers. While we have no direct evidence of the fact, it is supposed that the Chinese were familiar with canals long before they were known in Europe, and the Grand Canal, completed by them in the thirteenth century, is the first work of its kind after the beginning of the Christian era. The Romans constructed many canals for navigation, and these may be considered the origin of the present canal systems of Europe.

Canals are of necessity excavated on a level and cannot be adapted to a change in surface by grades, as can railroads. When the route traversed is so uneven that the construction of the canal on one level will involve too great expense, it is constructed on two or more levels called *reaches*, and each reach is connected with those above or below by the means of *locks*, *inclines* or *lifts* (See LOCK). All canals are constructed on practically the same plan. When the excavation is in soft earth, the banks slope and the channel is wider at the surface than at the bottom. When excavated in rock, the banks are usually perpendicular. Canals are carried across valleys on embankments or aqueducts. The top of the embankment is fashioned into the channel, which is lined with cement, but in case a bridge is used the structure serves as the support of a channel, which is constructed of steel or of wood and may or may not be lined with cement. The construction of a canal often necessitates works of great magnitude, such as deep cuts, high embankments, tunnels and aqueducts, and on account of the expense entailed most canals are government works. In the European countries they are constructed by the national governments, and in the United States some have been constructed by the national government and others by state governments.

Canals vary in size from a small ditch, excavated to connect two bodies of water, to channels that will float the largest ocean steamships. Those which are constructed for large steamers are known as *ship canals*. In general the bottom of the canal should be twice as wide as the widest boat that is to navigate the channel, and the depth of water should exceed the draft of the largest boats by at least one and one-half feet, since it requires less power to move a boat through a canal having an abundant supply of water than through one whose channel is just large enough to admit of the passage of the boat.

European Canals. Canals have been in general use in Europe since the beginning of the fifteenth century. The early canals contained only one level, but since the invention of the canal lock in 1480 they have been constructed to contain numerous levels. One of the most famous canals of Europe is the Languedoc Canal, connecting the Bay of Biscay with the Mediterranean. This canal was constructed between 1666 and 1681; it was 148 miles long, contained 119 locks and had a rise of 600 feet. At the time it was the most gigantic work of the kind that had been attempted. Many of the rivers of Russia, France and Germany have been *canalized,* that is, they have been dredged so as to make them navigable, and by connecting these streams by short canals thousands of miles of waterway have been provided, so that it is possible for boats to pass between almost all of the important commercial cities of Europe.

American Canals. The first canal in the United States was constructed around the falls in the Connecticut River at South Hadley, Mass., in 1793. Washington and other leading statesmen early saw the advantages of canals to connect the interior of the country with the Atlantic and with adjoining navigable rivers; yet it was a long time before any extended works were attempted. The Erie Canal, completed in 1825, was really the first enterprise in this country worthy of note (See Erie Canal). Between 1825 and 1850 several important canals were constructed. Most of these were for the purpose of connecting the Great Lakes with the Ohio River, or of connecting the coal mines in Pennsylvania with tide water. The last and greatest canal undertaken by the United States is that across the Isthmus of Panama. See Panama Canal.

A system of canals in the United States and southern Canada forms a navigable waterway between the Great Lakes and the Atlantic Ocean, by the way of the Saint Lawrence River. These canals begin at the rapids of Sault Sainte Marie, Michigan. The most important of them are the Soo Canal, the Welland Canal and the canals around the long Sault, the Cedar and the Lachine Rapids in the Saint Lawrence River. Their combined length is about 74 miles, and they afford the passage of steamers drawing fourteen feet of water. The mileage of canals in the leading countries of the world is shown in the following table:

COUNTRY.	MILES.
Russia	12,000
United States	4,300
Great Britain	3,900
France	3,000
Austria-Hungary	2,750
Germany	2,700

See Erie Canal; Sault Sainte Marie Canal; Suez Canal; Welland Canal.

Canal Do'ver, Ohio, a city in Tuscarawas co., 75 mi. s. of Cleveland, on the Tuscarawas River, the Ohio Canal and on the Baltimore & Ohio and several lines of the Pennsylvania railroad. It is near deposits of coal, iron and other minerals, and it contains iron and steel mills and manufactures of racing sulkies, roofing and other articles. It was settled in 1807 and was incorporated in 1865. Population in 1910, 6621.

Canaletto, *kah'na let'to,* Antonio (1697–1768), a Venetian painter who excelled in architectural painting. He is chiefly celebrated for his pictures of Venice, which give accurate and striking views of palaces, churches and prominent buildings. Bernardo Belotti (1724–1780), a nephew of Antonio who was likewise a good artist, lived in Dresden, where he was a member of the Academy of Painters. Both painters developed the pictorial treatment of architecture to a high point.

Canandaigua, *kan'an da'gwah,* N. Y., the county-seat of Ontario co., on Canandaigua Lake, 29 mi. s. e. of Rochester, on the New York Central and the Northern Central railroads. The manufactures include agate ware, tinware, leather and malt liquors. The town was first settled in 1789 and became a village in 1815. Population in 1910, 7217.

Cana'ries or **Canary Islands,** a cluster of islands in the Atlantic, 60 or 70 mi. w. of the northwest coast of Africa, belonging to Spain. They are thirteen in number, seven of which are of considerable size: Palma, Ferro, Gomera, Teneriffe, Gran Canaria, Fuerteventura and Lancerota. All are volcanic, rugged and mountainous, frequently presenting precipitous cliffs to the sea. The principal peak is that of Teneriffe, 12,182 feet. The area of the whole has been estimated at 2850 square miles. The fine climate and the fertility, which owes little to cultivation, justified the ancient name of *Fortu-*

nate Islands. There are no rivers of note, though streams are not infrequent. The exports consist of cochineal, wine, raw silk and fruits. Of the Guanches, the mysterious tribe who originally inhabited these islands, we know little. The islands were discovered and conquered by the Spaniards between 1316 and 1334; they then passed into the hands of the Portuguese, but were reconquered toward the end of the fifteenth century by the Spaniards, who subdued the inhabitants and now constitute the great bulk of the population. The fortified capital is Santa Cruz, and the city Laguna is the seat of the Roman Catholic bishop. The Canaries form a Spanish province. Population in 1900, 358,564.

Canary, a small finch, originally from the Canary Islands, but introduced into Europe several hundred years ago. Canaries have been bred in captivity so long that many remarkable varieties have developed, scarcely resembling the greenish little bird of Madeira. The topknots of some, the long, slender shapes of others, the yellows, browns, reds and blacks seen in their plumage are all unnatural. The Scotch fancy canary, with his long, slender, curved body, bent almost to a semicircle, is one of the strangest results of breeding. In the Harz Mountains and other parts of Germany and in the British Islands, the raising of canaries is quite an important industry, and large prices are paid for the highest type of singing birds. In the United States a good bird may often be bought for a dollar, but sometimes $150 has not been considered too high a price to pay for an especially fine singer. The birds require a clean cage, good seed, some green food, lime and plenty of cold water. Beyond this they need little care and thrive almost anywhere. Several books have been written on the care of canaries, among which may be mentioned Holden's *Canaries and Cage Birds*. In the United States the name *wild canary* is often given to the American goldfinch, or thistle bird, which, though entirely different, does somewhat resemble the captive canaries. See AMERICAN GOLDFINCH; BIRDS, *color plate*, Fig. 3.

Canary Seed, the seed of the canary grass. The seed is used as food in the Canaries, Barbary and Italy. It has been successfully cultivated in England and the European continent, where it is used extensively as a food for cage birds.

Canary Wood, the light orange-colored wood of two trees of the laurel family, belonging to the Canaries and Madeira.

Can'by, EDWARD RICHARD SPRIGG (1819–1873), an American soldier, born in Kentucky. He graduated at West Point, served on the frontier and took an active part in the Mexican War. In 1861 he became colonel of the Nineteenth United States infantry, distinguished himself in various positions and during the draft riots in New York City had command of the United States troops. He captured Mobile, and at the end of the war he received from General Richard Taylor the surrender of the last Confederate army in the field. In 1873, Canby was sent, with two others, as commissioner to treat with the Modoc indians, who, under their chief, "Captain Jack," had sought refuge in the lava beds of Oregon. He was treacherously killed with his companions, while under a flag of truce.

Cancellation, *kan'sel la'shun*, in mathematics the process of striking out equal factors in the dividend and the divisor. It is based upon the principle that if a number is multiplied by another number and its product is divided by the same number, the two operations offset each other, or *cancel*; hence, both operations may be omitted. For instance, $\frac{5 \times 3}{3} = 5$; $\frac{6^2 \times 4}{3} = 8$. See ARITHMETIC.

Cancer, *kan'sur*, the common name of a malignant tumor growing in some part of the body. At the center of the growth, which gradually penetrates the tissues, the cancer elements predominate, while nearer the margin they become fewer, and, finally, along the lymphatics, there are only small isolated groups of cancer cells. This makes it difficult for the surgeon to cut out the growth completely, and gives rise to the popular notion that a cancer has roots. Cancers are divided into two classes, *sarcomas* and *carcinomas*, or true cancers. Sarcomas spread by the blood, which carries cells to various parts of the body, where they set up little colonies. This form of cancer is not hereditary, but it is common in early life and occurs at any age. It may follow injury or develop in preëxisting mild growths. If the skin or membrane at the surface gives way, the sarcoma projects as a bleeding mass.

In carcinomas, or true cancers, the cells multiply rapidly. Extension occurs usually by the lymphatics and rarely by the blood vessels. Cancer rarely occurs in people under forty. Its development is often started by local irritation, as by a pipe stem on the lip, gallstones in the gall bladder and the rubbing of a corset steel on the breast. Continued irritation or a single injury may excite the growth. Heredity seems to have some influence, though this may be simply heredity of the habits that predispose to cancer—such as excessive feeding, disproportionate use of meats and the excessive use of salt. The parasitic origin of cancer is often urged, but it has never been proved. Cancer is more common in women, and it is rare in those who are tuberculous. It is increasing in some countries.

In all forms of cancer the favorite treatment is early and complete removal by knife, cautery or chemical caustics. Cutting off the blood supply checks the growth. The Roentgen or X-ray is being applied to external cancer, with asserted benefit and some undoubted cures. The injection of solutions of nucleinic acid into and around the tumor is being extensively tried, and the reports are exceedingly encouraging.

Cancer, (the crab), the fourth sign of the zodiac, entered by the sun on or about the twenty-first of June and quitted a month later. The symbol is ♋. The constellation of Cancer is no longer in the sign of Cancer, but at present occupies the place of the sign of Leo (See ZODIAC). The Tropic of Cancer is the name given to the northern tropic. See TROPICS.

Candahar, *kahn da hahr′*. See KANDAHAR.

Can′dia. See CRETE.

Can′dle, an artificial material for making light, made by running tallow, wax, spermaceti or paraffin around a wick. Ancient Roman candles consisted of the pith of a kind of rush, surrounded with tallow or wax. In England, during the Anglo-Saxon period, ordinary candles were merely masses of fat plastered round splinters of wood. Candles are made by two processes, dipping and molding, but chiefly by the latter. In large manufactories, machinery is employed in molding as well as in dipping. *Wax candles* are seldom molded, on account of their adhesion to the molds and their contraction in cooling. A different method of manufacture, termed *basting*, is accordingly resorted to. Wax candles are still employed in the Catholic and Greek churches, as indispensable accessories of the altar. *Sperm candles* are composed of spermaceti mixed with beeswax. *Paraffin candle* manufacture is now carried on on a most extensive scale. Paraffin candles are much in demand on account of their cheapness and the clearness and brilliancy of their light. The indians of Alaska make candles of a fish called the *candlefish*. They run a wooden or rush wick through the body lengthwise, then dry the fish. When lighted at the tail, it burns like a candle.

Can′dleber′ry or **Wax Tree** or **Wax Myrtle,** a shrub growing from four to eighteen feet high, and common in North America, where candles are made from its small berries, which are covered with a greenish-white wax popularly known as bayberry tallow. The wax is collected by boiling the berries in water and skimming the surface. A bushel of berries yields from four to five pounds of wax.

Candlefish, a sea fish of the salmon family, of about the size of the smelt, frequenting the northwestern shores of America. It is converted by the indians into a candle, simply by passing the pith of a rush or a strip of the bark of the cypress tree through it as a wick, when its extreme oiliness keeps the wick blazing. The oil is extracted and is sometimes used as a substitute for cod-liver oil.

Can′dlemas, a church feast, instituted in 492 in commemoration of the presentation of Christ in the temple and of the purification of Mary. It falls on February 2, and on this day, among Catholics, lighted candles are carried about in procession, and all candles and tapers which are to be used in the churches during the entire year are consecrated. The feast is retained by the Anglican Church and is also observed by the Lutherans.

Candle-nut, the nut of a tree of India, Java, the Moluccas and the Pacific islands. It is about the size of a walnut and yields an oil used for food and for lamps, while the oily kernels are also strung together and lighted as torches.

Candy Making. The chief ingredient of candy is sugar. A small amount of glucose is added to the sugar to give the proper consistency. This composition is boiled in water until the syrup is thick and almost clear. This syrup is then poured out upon huge marble slabs, where it is allowed to cool for a time. It is then worked by means of long iron paddles, much as a plasterer would stir mortar. Under this treatment it becomes hard, white and almost crystalline. This process is sometimes carried on in copper kettles, which not only cook the ingredients, but beat them white and hard by means of a rotating dasher. The candy is now ready to be cast into various sizes and shapes. Candy is cast in cornstarch molds. The starch is placed in narrow, shallow boxes and smoothed off at the top. The boxes are run under a press, the lower part of which is covered by projections of just the size required. When the press goes down, a little hammer taps the top of it automatically, and the cornstarch is punctured with rows of smooth, clear-cut holes. When the molds are complete, they are filled from a tank with cream candy. Marshmallows are cast in the same way. When the candy in the molds is dry and hard, the boxes are taken to a machine called the "starch-buck." Here the starch and candy are dumped into a hopper, under which is a series of sieves. The starch falls through the meshes, and the candy is carried on through a series of brushes to take off the remaining starch.

Chocolate creams are dipped by means of a little wire spoon, after which they are placed on a piece of oilcloth and set in a frame to dry. For the manufacture of lozenges and candy hearts, the sugar is mixed cold in large tubs, and the lozenges are pressed out in molds. Mottoes are printed on the hearts with a rubber stamp. For cocoanut candy, the nuts are bought whole, and the hard, white meat is taken out and placed in a kettle, where it is boiled and violently stirred at the same time, by means of rotating dashers. Sugar is added, and when the mass is sufficiently cooked it is placed on a marble slab and rolled down even with a long, cylindrical roller Cocoanut is colored and molded into various forms and is sliced up in strips with a patent cutting machine. Caramels are made of sugar and pure cream, carefully boiled together until the product is of proper consistency, and then poured on marble slabs to cool. They are then cut and wrapped. Hard candy is made of sugar boiled over an open fire and then colored in various shades. The batches are mixed and rolled out by hand until they are the size of an ordinary stick of candy, after which they are cut up into the regular lengths. Rock candy and many of the sugared nuts are made by crystallizing sugar. A tin box, in which numerous strings run from top to bottom, is filled with sugar and set away in a warm place. The crystals of sugar form on the strings and harden there, thus making the well-known rock candy. In the same way crystals are allowed to form on almonds and other nuts and fruit.

Cane, a term sometimes loosely applied to any small and smooth rod, of the thickness of a walking stick or less; but more correctly limited to the stems of the smaller palms and the larger grasses. We thus speak of sugar cane or bamboo cane among the latter; while among the former this name is particularly appropriated to the species of the rattan. To this genus belong the canes largely imported from the tropical regions of the East, for making bottoms of chairs and couches.

Canel'la, WHITE, a tree belonging to the West Indies, growing to the height of 10 to 50 feet, with a straight stem, branched only at the top. It is covered with a whitish bark, which is freed from its outward covering, dried in the shade and brought to Europe in long quills, somewhat thicker than those of cinnamon. It is moderately warm to the taste and is esteemed as a pleasing and aromatic bitter.

Cane Sugar. See SUGAR, subhead *Cane Sugar.*

Ca'nis Ma'jor, (the greater dog), a constellation of the southern hemisphere, remarkable because it contains Sirius, or the Dog Star, the brightest of all stars.

Can'ister. See CASE SHOT.

Can'ker, the name given to a collection of small ulcers in the mouth, especially of a child. Canker is also the name of a disease to which fruit trees are especially liable. It begins in the younger shoots and gradually extends to the trunk, in time killing the tree.

Cankerworm, the destructive larva of certain moths, very common in northeastern United States and Canada. Cankerworms attack apple and pear trees, especially, though other trees suffer when the insects are numerous. The larvae appear at about the same time as the leaves, and they are voracious feeders. When disturbed they drop from the leaves and hang suspended on silk threads. If they reach the ground they must climb the trunk to resume their feeding. The female is compelled to climb the trunk in order to lay her eggs, and accordingly the defense against cankerworms is to surround the trees in spring time by bands, over which the insects cannot crawl. See MEASURING WORM.

Cannae, *kan'nee*, a town of south Italy, province of Bari, near the mouth of the Ofanto, formerly the Aufidus River. The place is of historical importance, because it was the scene of the battle in which the Roman army sustained a terrible defeat by Hannibal in 216 B. C. The Romans numbered 80,000 infantry and 6000 cavalry, whereas Hannibal's army consisted of 10,000 cavalry, but only about 40,000 infantry. Of the Romans 70,000 fell, including the consul Lucius Paulus and eighty men of senatorial rank. Hannibal lost not quite 6000.

Cannes, *kan*, a seaport of France, on the shore of the Mediterranean, in the Department of

Alpes-Maritimes, famous as a winter resort, and as the place where Napoleon landed when he returned from Elba, March 1, 1815. Population in 1901, 29,800.

Can'nibal, a person who eats human flesh. The Spanish discoverers found the practice of eating human flesh to exist among the Caribs, a West Indian tribe, and from their name came the word cannibal. Since that time it has been found that the practice existed among ignorant and barbarous tribes in all parts of the world. In some instances cannibalism seems to have been of the nature of a religious rite, the victims being first sacrificed to a god and later eaten; but in many other cases the practice appears to have been rather the natural result of ferocity or to have originated in a natural demand for flesh. Only a few of the indian tribes of the United States indulged in cannibalism to any great extent.

Can'ning, a process of preserving fruits, vegetables and meats, by enclosing them in airtight cans. This process was discovered in 1795 by a Frenchman named Nicholas Appert, and it was introduced into the United States about 1815, though as an industry canning was not developed until some time after that date. The principle underlying canning is that the germ which causes fermentation must be killed or driven off from the articles in order to preserve them. Since heating always kills this germ, the articles are cooked either before or after being placed in the can. In most of the factories in the United States the fruits and vegetables are first cleaned and sliced, then placed in cans. The covers are soldered on and a small hole is left in the cover to allow the steam to escape. The cans are then placed in a steam boiler and subjected to a high temperature, until the contents are thoroughly cooked. The vents are then closed by placing a drop of solder over them, the cans are run through a tank of water, as a test for leakage, are then allowed to cool and finally are labeled and packed for market.

Canning has become an important industry in the United States. By its means nearly all fruits are preserved in excellent condition, and such vegetables as green corn, beans, peas and tomatoes are canned in large quantities. Both fresh and salt meats are preserved in this manner in the packing houses, and the canning of salmon is one of the most important industries on the Pacific coast. Menhaden, sardines, halibut and other fish are also preserved in large quantities in this way.

Canning, George (1770–1827), a British statesman. Three years after entering Parliament in 1793, he was under-secretary of state, and in the following year he began the publication of a satirical paper, the *Anti-Jacobin.* From 1804 to 1806 he was treasurer of the navy, and he twice held office as secretary for foreign affairs. In the movements for the abolition of the slave trade, the repeal of the Corn Laws and Catholic emancipation he was deeply interested, and his efforts had much to do with the ultimately successful outcome of the agitation on these questions. He was made prime minister in 1827, but he died in the same year.

Canning, Stratford, Sir. See Stratford de Redcliffe, Viscount.

Can'non, a big gun or piece of ordnance. Historical Development. The precise period at which engines for projecting missiles by mechanical force were supplanted by those utilizing explosive materials is a matter of controversy, the invention of cannon being even attributed to the Chinese, from whom the Saracens may have acquired the knowledge. They were brought into use in France as early as 1338. At first they were made of wood, well secured by iron hoops, the earliest being somewhat conical, with wide muzzles, and the later, cylindrical. They were then made of iron bars firmly bound together with iron hoops like casks Bronze was used in the second half of the fourteenth century, toward the close of which cast-iron ordnance came into use. A form of breech-loading cannon was introduced in the sixteenth century. Cannon were formerly dignified with great names. Twelve cast by Louis XII were called after the twelve peers of France, and Charles V had twelve called after the twelve apostles. Later, such names as the following came into general use; cannon royal, or carthoun, carrying 48 pounds; culverin, 18; demiculverin, 9; falcon, 6; basilisk, 48; siren, 60. Cannon were then named from the weight of the balls which they carried—6-pounders, 12-pounders; but they are now usually designated by their weight, especially the large ones, as a 25-ton gun, an 80-ton gun. Their caliber or diameter of bore is also used in designating them.

Great improvements and changes in the manufacture of cannon have been introduced in recent times. Not long ago they were all made of iron, brass or gun metal (a variety of bronze), by casting. The introduction of rifled small arms led the way to that of rifled cannon, and the adoption of heavy armor for ships of war rendered guns of enormous power and magnitude necessary in order to penetrate their sides. The increased inertia of the projectiles and their rapid rotation in these rifled guns tried the piece so severely that cast iron and even bronze have been largely used.

Manufacture. The process of making modern cannon begins in the office of the factory draughtsman, and the drawings and figures of every dimension are made with the greatest accuracy. Specifications when completed go to the shop, where the forgings of steel are all in waiting. The gun is made up of a central tube, covered by a jacket, which is bound by rings on the outside. The gun goes through a long course of lathes and boring machines; some of these lathes are 130 feet long, have a swing of 8 feet and are capable of boring a gun 50 feet long and weighing more than 120 tons. The gun may be turned on the outside and bored on the inside at the same time. When a gun leaves the lathe it is carried along to a revolving machine, by a traveling crane overhead. The revolving machine plows the interior surface of the gun with a spiral groove, which gives the shell a rotary motion when fired. These cuttings are made accurate to the thousandth part of an inch. The climax of the operation is the assembling of the gun. The principle of the whole process lies in keeping the tube of the cannon cool and expanding the jacket by means of hot air so it will slip easily over the tube. When the jacket cools it contracts and grasps the tube almost as closely as if they were one piece of metal The heating is done entirely by hot air. In the pit there is one furnace filled with coils of pipe, through which air is forced by a compressing pump. The air underneath is heated by a gas fire. In this condition it is forced through the cylindrical compartment in which stands the gun-jacket and is passed off by a chimney. After the heating process has gone on for a day or two, the lid of the jacket apartment is lifted and the top of the cylinder of iron is measured to see if the expansion has made it large enough to fit over the tube. It is necessary that the inside diameter of the jacket be about one tenth of an inch greater than the exterior ot the tube. The tube of the cannon is placed upright in the pit, for the reception of the jacket. Inside of the tube cold water is kept flowing, so that the steel will be as much contracted as possible. When all is ready, the lid of the jacket apartment is thrown open, and the traveling crane carries the jacket directly over the tube, where it is accurately plumbed, so that it will slip down over the tube without touching it. This operation must be performed very quickly, so that the jacket will not contract too much. After the jacket has been put on, the gun remains in the pit for about two days to cool, when it is taken to the lathe again to be prepared for the hoops, or cylindrical pieces of steel. Nine of these are shrunk on while the gun is in a horizontal position. There are other methods by which cannon are built, and sometimes they are made of successive hoops of steel laid one about another so that each layer will shrink upon the other. Successful experiments have been tried in winding a gun with heavy square wire; but the cannon whose manufacture we have described at length is the one that has developed into the tremendous modern engine.

Use. A cannon must deliver an accurate, destructive and rapid fire without harm to its gun crew, and must be adapted to the distinct purpose for which it is to be used. The engineer in planning the gun must provide for the strains which are due to its weight and the tendency of the explosion to tear the gun either lengthwise or crosswise. The powder chamber is slightly larger than the bore and slopes down to it. The slower burning powders are gradually coming into use, and in this way the force is communicated to the bullet gradually, and some of the terrific strain upon the breech is relieved and distributed along the barrel toward the muzzle. Cannon are never placed in use until after they have been carefully tested, both for strength and accuracy. The breech of the cannon is an improved piece of mechanism which must move swiftly and smoothly into its place and yet be strong enough to bear the terrific recoil of the discharge. Various forms of mechanism are in use, but in the United States most of the cannon are fitted with what is called the interrupted screw. In the latest modification of this, the breech block is divided into twelve or more longitudinal sections, every fourth one of which is blank, while the others have screw threads and vary in diameter. One-twelfth of a turn of the breech block will engage three-fourths of its surface into the breech. The Vickers-Maxim breech mechanism, adopted recently for the heavy guns in the United States navy, has the advantage of ejecting automatically the exploded primer and raising the new load into position at the gun breech. See Gun Carriage; Artillery.

Cannon, Joseph G. (1836–), an American lawyer and statesman, born at Guilford, N. C. He was admitted to the bar in Illinois and was state's attorney for Vermilion County (1861–1868). In 1873 he was chosen to Congress as a Republican and he was reëlected continuously till 1891 and again from 1893 to 1910. He became a leader in that body, served several terms as speaker and was frequently mentioned as a candidate for president of the United States.

JOSEPH G. CANNON

Cano, *kah'no,* Alonso (1601–1667), a painter, sculptor and architect, who has been called the Michelangelo of Spain. He studied painting under Herrera. He first made himself known by his statues for the great church of Lebrija, and he came to the notice of the king, who appointed him court painter and architect. Later he was given a position in Granada, his native town, and he remained there until his death. His works show accuracy, combined with simplicity and great beauty.

Canoe, *ka noo',* a light boat, narrow in the beam and propelled by paddles, often in conjunction with sails. The name was originally given to the boats of uncivilized races, but its application has been considerably extended, and canoes of home make may be seen on the waters of most civilized countries. They are of the most diverse materials and construction. The simplest ones were hollowed out of a single log and were known as *dugouts.* The indian canoes of Canada are of birch bark covering a wooden frame. The Eskimo *kaiak* consists of a light wooden frame covered with seal skins sewed together with sinews, and having only one opening to admit the boatman to his seat. In the islands of the Pacific the natives have double canoes, united by a strong platform and serving in this way as one vessel. See Canoeing.

Canoeing, *ka noo'ing,* a summer sport that has gained considerable popularity in all parts of the country. The canoes are of various forms and sizes and may be propelled entirely by paddling or by the use of sails. A canoe is sharp at both ends; the form most commonly seen in paddling resembles somewhat the indian birch bark canoe and is known as the *open Canadian canoe.* This, with a form almost as popular, known as the *decked canoe,* is shown in the accompanying drawing. Canoeing is a delightful pastime wherever there are lakes, rivers and forests. The boat draws little water and under skillful management can be taken successfully through rapids and can be sent with great speed over the still water. Every summer many people leave the cities on camping excursions and with their canoes are able to explore many delightful places that otherwise would be entirely inaccessible. There are canoe clubs in many localities, and there is also a national association, which provides for meets and racing.

CANOES

Cañon, *kan'yon.* See Canyon.

Canova, *ka no'va,* Antonio (1757–1822), an Italian artist, one of the most prominent figures of modern times in the field of sculpture. At the Academy of Venice he had a brilliant career, and in 1779 he was sent by the senate of Venice to Rome, where he produced his *Theseus and the Slain Minotaur.* In 1783 Canova undertook the execution of the tomb of Pope Clement XIV in the Church of the Apostles, a work inferior to his second and perhaps his best public monument, the tomb of Pope Clement XIII in Saint Peter's. *Psyche and Butterfly, Hebe,* the colossal *Hercules*

Hurling Lichas into the Sea, the *Pugilists* and the group of *Cupid and Psyche* are among his more noted works. In 1796 and 1797 Canova finished the model of the celebrated tomb of the archduchess Christina of Austria and made the colossal model of a statue of the king of Naples. He afterward executed in Rome his *Perseus with the Head of Medusa*, which, when the *Belvedere Apollo* was carried to France, was thought not unworthy of its place and pedestal. In 1802 he was invited by Bonaparte to Paris to make the model of his colossal statue

Canovas del Castillo, *kah′no vas del ka steel′ yo*, Antonio (1828–1897), a Spanish statesman. He became a journalist, soon drifted into politics and in 1852 was elected to the Cortes. His views from the outset were always liberal-conservative, and he was prominent in the movement for placing Alfonso XII on the throne. He was prime minister of Spain in 1874 and 1875, and during the next twenty years he held the office several times. He was killed by an anarchist.

Can′so, Gut, or Strait, of, a narrow strait or channel, about 17 miles long, separating Nova Scotia from Cape Breton Island. One of the Atlantic cables lands here.

Canta′brian Mountains, the general name given to the various mountain ranges extending from the western Pyrenees along the north coast of Spain to Cape Finisterre. Their length is slightly over 300 miles, and in elevation they vary from 3000 to 8800 feet. The highest peaks are near the center of the range. They present numerous bold promontories and headlands along the coast.

Cantaloupe, *kan′ta loop*, a small round variety of muskmelon, globular, ribbed, of pale green or yellow color, and of delicate flavor. It was first grown in Europe at the castle of Cantaloupe.

Cantata, *kan tah′ta*, a name given to a class of musical and vocal compositions, usually in the form of oratorios, including solo and chorus numbers and instrumental accompaniment. The cantata is shorter than either oratorio or opera, and when written upon a sacred theme, differs from the former in being less symbolical; when written upon a secular theme, it differs from opera in its lack of scenic accessories. See Opera; Oratorio; Music.

Canterbury, *kan′tur ber′ry*, a city of England, in Kent, 55 mi. e. s. e. of London. It is especially famous for its cathedral, which was built between the eleventh and fifteenth centuries and is a magnificent specimen of the different styles of Gothic architecture. Here was situated the famous shrine of Thomas à Becket, to which multitudes of pilgrims came annually. Among the other churches here are Saint Martin's and Saint Dunstan's, both of which are famous. There is also a grammar school, founded by Henry VIII; Jesus Hospital, founded in 1595; a guild hall, and an art gallery. The chief trade of the town is in hops and grain, and the city was formerly noted for its silk manufactures and for its damask linen. Canterbury existed before the Roman invasion, was made an important military station by the Romans and later became the capital of the Saxon kingdom of Kent. The archbishopric was founded in 597. The most famous of the archbishops have been Saint Augustine, Saint Dunstan, Thomas à Becket, Cranmer and Laud. The archbishop of Canterbury is the primate of all England. He crowns the ruler in Westminster Abbey and is given many other privileges. Population in 1901, 24,899.

Can′tilev′er. See Bridge, subhead *Cantilever Bridges.*

Canton′, (Chinese, Kuang-chow-foo), a nimportant city of southern China, in the province of Kwang-tung (of which name Canton is a corruption). The city proper is enclosed by a wall seven miles in extent, and is divided into two parts by a wall running east and west, the larger portion, north of this wall, being called the *old*, that on the south of it, the *new*, city. It is also defended by four strong forts, erected on hills on the north side. The foreign mercantile houses and the British, French and American consulates have as their special quarter an area in the suburbs of the southwest of the city, with water on two sides of it. In the European quarter are churches, schools and other buildings in the European style. The river opposite the city for the space of four or five miles is crowded with boats, a large number of which are fixed residences of many thousands of people. The industries of Canton are varied and important, embracing the manufacture of silks, cotton goods, porcelain, glass, paper, sugar, lacquered ware, firecrackers and metal goods. It was the chief foreign emporium in China until 1850, when Shanghai began to surpass it and other ports to compete with it. Canton was not formally opened to foreign trade until the close of the seventeenth century. In 1841 the British captured the forts of Canton and retired from the city only on the payment of £6,000,500. From 1857 to 1861 the city was again occupied by the British and French armies. Population, estimated at about 900,000.

Can'ton, Ill., a city in Fulton co., 28 mi. s. w. of Peoria, on the Chicago, Burlington & Quincy and the Toledo, Peoria & Western railroads. It is in a fertile agricultural district and has coal mines and manufactures of implements, cigars, tile and brick. The town was settled about 1832 and now owns its waterworks. Population in 1910, 10,453.

Canton, Ohio, the county-seat of Stark co., 60 miles s. e. of Cleveland, on the Pennsylvania, the Baltimore & Ohio and the Cleveland & Canton railroads. It is situated in a wheat-growing district, with coal, limestone and pottery clay in the vicinity. The manufactures of agricultural implements, iron bridges, machinery and stoves are the principal industries. The city has electric lights, street railways and well-paved streets. It was for many years the home of the late President McKinley. Population in 1910, 50,217.

Canute' (about 994–1035), king of England, Denmark and Norway. He became king of England on the death of his father, Sweyn, in 1014, and confirmed the Danish power in England. He began by devastating the eastern coast and extended his ravages in the south, where, however, he failed to establish himself until after the assassination of Edmund Ironside, when he was accepted king of the whole of England (1017). Canute, who began his reign with barbarity and crime, afterward became a humane and wise monarch. He restored the English customs at a general assembly, ensured to the Danes and English equal rights and equal protection of person and property and even advanced English subjects to the most important posts. At the death of his brother in 1018 he gained Denmark; in 1028 he conquered Norway, and in 1031 he made Malcolm of Scotland admit his superiority.

Can'vas, a strong, coarse cloth, usually made of hemp or flax. It is extensively used for sails, tents and awnings. The canvas used for the sails of large vessels is made of flax and is called sailcloth. A lighter and thinner variety, called duck, and made of linen or cotton, is used for small sails. Duck of finer quality is a favorite material for men's and women's summer outing costumes. The canvas used by artists for oil paintings is usually of linen.

Canvasback, a sea duck living in the inland waters of North America, where it feeds upon the roots of the wild celery. It is a large bird, and, as it is considered the finest of water fowl for the table, it is being hunted to extinction. The plumage is black, white, chestnut-brown and slate color. As it has a reddish head, it is often confused with the redhead, a duck that is often substituted for it in the markets.

Can'yon or **Cañon,** the Spanish word for tube or funnel, applied by the Spanish Americans, and hence in North America generally, to long and narrow river gorges or deep ravines with precipitous and almost perpendicular sides. Canyons are numerous in the Rocky and Sierra Nevada mountains, and some of them, particularly the canyons of the Yellowstone, Yosemite Valley and the Grand Canyon of the Colorado, are numbered with the world's greatest scenic wonders.

Caoutchouc, *koo'chook.* See India Rubber.

Cap, a covering for the head. It differs from a hat in having no brim. Caps made of worsted, fur or some other soft material, with or without a visor, are worn by men and in some countries by women. Among the ancient Greeks and Romans, caps were worn as a sign of freedom; hence, the cap became in all nations a symbol of liberty. A cap made of lace and silk or muslin was formerly a fashionable style of head-dress for women, but is now not much worn except by servants.

Cape Ann, a promontory off the northeast coast of Massachusetts, 31 mi. n. e. of Boston. On this cape are the towns of Gloucester, Rockport and Pigeon Cave. There are valuable stone quarries here.

Cape Bar'row, the most northerly point of Alaska. A government station is located here.

Cape Blanco, *blahN'ko,* a name given to several capes. 1. A cape off the west coast of Africa, on the Atlantic. 2. The most northerly point of Africa, on the northern coast of Tunis. 3. A cape on the west coast of Morocco. 4. The most westerly point of Oregon, in the United States, on the Pacific coast. A lighthouse is located here.

Cape Bret'on, an island of the Dominion of Canada, separated from Nova Scotia, to which province it belongs, by the narrow Gut or Strait of Canso. Its length is 100 miles, and its greatest breadth is 85 miles. The surface is rather rugged, and only small portions are suited for agriculture, but it possesses much timber and valuable minerals (several coal mines being worked), and the coast abounds in fish. Timber, fish and coal are exported. The island belonged to France from 1632 to 1763, when it was ceded to England, and Louisburg, its capital, was long an important military post. Population in 1901, 97,200.

Cape Catoche, *ka to'chay*, a cape which is at the extreme northwestern point of Yucatan.

Cape Charles, a cape at the southern extremity of Northampton co., Va. It is at the entrance of Chesapeake Bay and is 25 miles north-northeast of Norfolk.

Cape Clear, a promontory 400 feet high at the southern extremity of Clear Island, the most southern point of Ireland, about seven and a half miles southeast of Baltimore, County Cork. Clear Island is about three and a quarter miles long and about a mile broad.

Cape Cod, a noted peninsula, 65 mi. long and from 1 to 20 miles broad, on the south side of Massachusetts Bay, forming Barnstable County in the State of Massachusetts. It is mostly sandy and barren but some portions are fertile and produce a large yield of cranberries, the cultivation of which is the leading agricultural industry. Other portions are well wooded. Provincetown, on the northern extremity of the peninsula, has an excellent harbor and is one of the most important fishing ports on the Massachusetts coast. A ship canal between Cape Cod and Buzzards bays is in process of construction.

Cape Colon'na, the southern extremity of Attica, Greece. Its summit is crowned by the ruins of a temple of Athena, 269 feet above the sea, of which sixteen columns of white marble are still standing.

Cape Col'ony, officially, Colony of the Cape of Good Hope, a British possession occupying the southern extremity of Africa and extending northward to the twenty-fifth parallel of south latitude. It is bounded on the north by German Southwest Africa, Bechuanaland, Orange River Colony and Natal, the Orange River forming the dividing line along part of the northern boundary. The area is estimated at about 277,000 square miles, or a little less than the combined areas of Texas, Massachusetts and New Jersey.

In the southern portion of the colony and along the coast the surface is mountainous and consists of rugged ranges, which rise in a series of successive elevations and enclose lofty plateaus and plains. These ranges run nearly parallel to the coast and attain their greatest elevation inland, where in some places the peaks are from 7000 to 10,000 feet high. The highest points in the northern portion are in the Drakenberg range, on the border of Natal. Table Mountain, rising directly above Cape Town, has an elevation of 3550 feet. Compass Mountain, in the Snow Mountains in the south central portion, is the highest point and has an elevation of 8500 feet. The northwestern region is less mountainous. The eastern coast is very regular, but the southern and western coasts have numerous indentations which form good harbors. The Orange River, which forms part of the northern boundary, receives a number of small tributaries. There are also a few small streams, flowing respectively into the Atlantic and the Indian oceans. None of these is navigable.

The climate is temperate in the south and semi-tropical in the north. The temperature is quite even and mild. Except along the coast in the southeast district, the rainfall is light, and the entire region is considered remarkably healthful.

Cape Colony is rich in minerals. Coal is found and worked in a number of localities. There are also deposits of copper, gold, silver and other metals, but the most important mineral is the diamond, which is found in very large quantities in Griqualand West, near Kimberley For a number of years the annual yield of these diamond mines has exceeded $20,000,000 in value (See Diamond; Kimberley).

A lack of rainfall prevents the fullest development of agriculture. All of the region is remarkably well adapted to grazing, and large numbers of cattle, horses, sheep and, especially, Angora goats are raised. Wherever the rainfall will admit, the land is tilled and good crops of wheat, indian corn and other grains are raised. Vegetables and fruits thrive remarkably well in regions having sufficient rainfall, and grapes are also raised and wine is made. Fruits and vegetables are frequently shipped to European countries. Ostrich farming is profitable, and over 160,000 birds are kept for their feathers (See Ostrich). The manufactures are of little importance and are confined to such local industries as the immediate needs of the people require.

The matter of transportation was early taken in hand by the British government, and, considering its internal conditions, the colony has a large number of good roads. There are also over 3000 miles of railway connecting the important towns. Cape Town is the southern terminus of the Cape-to-Cairo railway, which is now constructed across the Zambesi, and another line extending northward from Port Elizabeth reaches Bloemfontein, Johannesburg and Pretoria. From this several lines extending eastward reach important points along the coast. Nearly all of these lines are operated by the government, as are the telegraph lines. The commerce of Cape Colony is quite large. The exports consist of wool and mohair, hides and tallow, ostrich feathers, vegetables, fruits and diamonds, while the imports are nearly all of manufactured products and such food stuffs as are not readily produced in the country. The most of the foreign trade is with the United Kingdom.

The inhabitants consist of English, Dutch and natives, which are divided among the Hottentots, Kaffirs, Basutos and Griquas. There are also a number of Malays and, mingled with these, quite an extensive mixed race resulting from intermarriages. By far the larger part of the white population is of Dutch and English descent, and both the Dutch and English languages are in use.

Cape Colony is governed very much as other organized British colonies. The chief executive is a governor general appointed by the crown, and he is assisted by a ministry of six members. The legislative department consists of a council of twenty-three members, elected for seven years, and an assembly of ninety-five members, elected for five years. The franchise is restricted to property holders, and to those whose income reaches a specified sum. A system of public schools is maintained. There are a number of colleges, and at the head of the educational system is the University of Cape Colony, which is only an organization for the purpose of conducting examinations and granting diplomas and degrees. The important cities are Cape Town, Port Elizabeth and Kimberley, each of which is described under its title.

The region was settled by the Dutch in 1652. In 1795 it was occupied by the British, but seven years later they relinquished it to the Dutch, only to take possession of it again in 1806. Thirty years later the Dutch settlers, or Boers, dissatisfied with British rule, emigrated in large numbers to the north and settled what are now Orange River Colony and Transvaal Colony. Between these settlers and the surrounding native tribes the colony was frequently involved in war. In 1902 British supremacy was thoroughly established. In 1909 the colony joined the South African Union. See SOUTH AFRICAN WAR; ORANGE RIVER COLONY; TRANSVAAL COLONY; AFRICA, subhead *South African Union.*

Cape Com′orin, the southernmost extremity of the peninsula of India. A short distance from the cape are the remains of the once famous town of Cape Comorin, consisting of a fort, village, church and some ancient temples.

Cape Farewell, a cape at the southern extremity of Greenland, situated in latitude 59° 49′ n. and in longitude 43° 56′ w.

Cape Fear, a cape in North Carolina, extending from Smith Island into the Atlantic; the southern extremity of the state. Navigation is dangerous around this point, because of the character of the waters.

Cape Fear River, a river in North Carolina, formed by the Deep and the Haw rivers, which unite at Haywood, in Chatham County. It flows in a southeasterly direction and enters the Atlantic Ocean at the southern point of New Hanover County and at Cape Fear. It is about 250 miles long.

Cape Finisterre, *fe ne stair′*, the most western cape of Spain, on the coast of Galicia.

Cape Flat′tery, a cape in the State of Washington, bounded on the n. e. by the Strait of Juan de Fuca and on the s. w. by the Pacific Ocean.

Cape Girardeau, *je rahr do′*, Mo., is located on the Mississippi River, 131 mi. s. of Saint Louis, and on the Frisco and other railroads. Saint Vincent's College, a Catholic institution, and a state normal school are located here. It has extensive stone quarries, lumbering plants, flouring mills, machine shops and other factories. It is one of the oldest towns in the state, having been settled by the French about 1765. Population in 1910, 8475.

Cape Hat′teras, a cape on the coast of North Carolina, the projecting point of a long reef of sand, which storms and shoals make dangerous to navigation. A lighthouse over 190 feet high has a light that flashes every ten seconds, and three quarters of a mile south there is another steady white light 35 feet above the sea.

Cape Haytien or **Haitien,** *ha′te en,* a town on the north coast of Hayti. It has an excellent harbor, but has declined in importance during the last century. It exports coffee, cacao, logwood, hides and honey. Population, about 29,000.

Cape Henlo′pen, a cape on the east coast of Delaware, at the entrance of Delaware Bay. This cape is 13 miles southwest of Cape May.

Cape Hen′ry, a cape on the coast of Virginia, at the entrance of Chesapeake Bay, not far from Cape Charles. There are here a life-saving station and a lighthouse.

Cape Horn or **Cape Hoorn,** the southern extremity of an island of the same name, forming the most southerly point of South America. It is a dark, precipitous headland, 500 to 600 feet high, running far into the sea. Navigation round it is dangerous on account of frequent tempests. The cape was first doubled in 1616 by Schouten, a native of Hoorn, in Holland, whence its name.

Cape Lisburne, *liz'burn,* a cape on the northwestern coast of Alaska. It is of importance by reason of its deposits of coal.

Cape Look'out, a point of land on the east coast of North Carolina, about 85 mi. s. w. of Cape Hatteras.

Cape May, N. J., sometimes called Cape City or Cape Island City, situated in Cape May co., being the southernmost city of New Jersey, on the Atlantic City and the West Jersey & Seashore railroads. It is a popular watering place, has many commodious hotels and a very pleasant climate. The industries are gold-beating, canning, oyster raising and fishing. Population in 1905, 3006.

Cape Mendocino, *men do se'no,* the most westerly point of California, on the Pacific coast.

Cape of Good Hope, a promontory near the southern extremity of Africa, at the termination of a small peninsula extending south from Table Mountain, which overlooks Cape Town. This peninsula forms the west side of False Bay, and on its inner coast is Simon's Bay and Simon's Town, where there is a safe anchorage and a British naval station. Bartholomeu Dias, a Portuguese, who discovered the cape in 1487, called it Cape of Tempests, but John II of Portugal changed this to its present designation. It was first doubled by Vasco da Gama in 1497.

Cape Prince of Wales, a cape at the extreme western point of North America, in Bering Strait, at longitude 167° 59′ 10″ west.

Ca'per, the unopened flower bud of a low trailing shrub which grows from the crevices of rocks and walls and among rubbish, in the countries bordering on the Mediterranean. The plant was introduced into Great Britain as early as 1596, but has never been grown on a large scale. The buds are pickled in vinegar and used in making sauces for meats. The flower buds of the marsh marigold and nasturtium are frequently pickled and eaten as a substitute for capers.

Cape Race, the extreme southeastern point of Newfoundland. A lighthouse is located on this cape.

Capercailzie, *ka pur kale'ze,* or **Cock of the Wood,** the largest of the European grouse, weighing from nine to twelve pounds. The male has an ashy black neck; head, wings and shoulders brown, speckled with small black dots; a variable green breast, and a black belly with white spots. The tail feathers are black, with small white spots near the extremities. The flesh of the capercailzie is highly esteemed for the table in Scotland and Ireland.

Capernaum, *ka pur'na um,* a town in ancient Palestine, frequently mentioned in the Bible. It was on the northwest shore of Lake Gennesaret, but its exact site is unknown. Because it was so often visited by Jesus it was often called "his own city." Many of his miracles were performed here, but it remained unrepentant. Peter, Andrew and Matthew had their homes in Capernaum.

Cape Sa'ble, the name applied to two capes. 1. The most southerly point of the mainland of Florida. 2. The southern extremity of Nova Scotia, Canada.

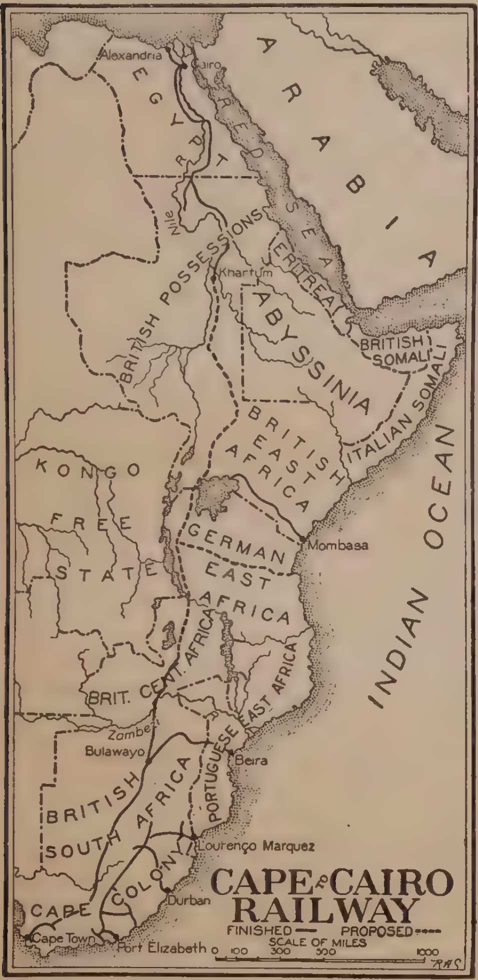
Cape Saint Vincent. the southwest point of Portugal. It is noted for the naval victory gained here by the English, under Sir John Jervis (afterward earl of Saint Vincent), on Feb. 14, 1797. over the Spanish.

Cape San Lucas, *loo'kas,* the most southerly point of the peninsula of Lower California.

Capetian, *ka pe'shan,* **Dy'nasty,** the dynasty which ruled in France from 987 to 1328. It began with Hugh Capet, chosen king by the help of the clergy on the death of the last of the Carolingians, and closed with Charles IV, who died in 1328. Throughout this long period, during which, for the most part, son followed father in regular succession, the royal power greatly increased, and France became more nearly a centralized state. The growth of the royal power is shown by the fact that the custom of crowning the son during the father's lifetime, common with the early kings of this House, was found unnecessary after the twelfth century.

Cape-to-Cairo Railway, a trunk line of railway, projected by Mr. Cecil Rhodes, to extend through the interior of Africa from Cape Town to Alexandria. This railway project was preceded by the Cape-to-Cairo telegraph, which it closely followed, and has been pushed forward rapidly.

The road has been gradually extended northward from Cape Town. In 1909 it reached the southern boundary of the Kongo State, a distance of 2147 miles, and southward from Cairo to a distance of 1300 miles. The distance between the terminal points is being shortened year by year. Plans for completing the line are thoroughly matured and though the time necessary for the completion of this gigantic enterprise will be longer than the promoters at first expected, in the near future Alexandria and Cape Town will be joined by a trunk line of railway. Between the Zambesi and Khartum two routes are possible; that to the east of the lakes through German East Africa, and that through Lake Tanganyika, Lake Nyassa and Lake Victoria. By this route the construction of about 1900 miles of road will be saved.



Six lines are projected or partially completed which will connect the main trunk line with various seaports on the eastern coast of the continent. Beginning at the south, these are: 1. The Natal railway from Durban into the Transvaal. 2. The Delagoa Bay railway from Lorenco Marques into Transvaal Colony. 3. The Beira railway, extending from Beira to Salisbury. All of these lines have been completed to important points several hundred miles inland. 4. The German East African railway, beginning at Dar-es-Salaam and having one terminus at Ujiji, on Lake Tanganyika, and another on Victoria Nyanza. 5. The British East African railway, extending from Mombasa to Victoria Nyanza. This line of more than 600 miles is completed. 6. A line from Suakim, on the Red Sea, to Berber or Kassala. The British East African, or Uganda, railway really forms a system by itself. The first train over this line reached Port Florence, on Victoria Nyanza, Dec. 19, 1901. The construction of the road required over five years, the first rail having been laid at Mombasa, on the coast, in August, 1896. Along the entire line the construction called for the highest degree of engineering skill. The road passes through many deep cuts of solid rock and over thirty-eight viaducts of English make. The highest altitude is 3000 feet above the level of the sea, and the descents are unusually abrupt. The road traverses a region remarkable for the beauty of its scenery and for its natural resources, which are wholly undeveloped. By its completion this portion of Africa is opened to commercial relations with the world, and ready means of transportation are given to more than 4,000,000 people.

Cape Town, the capital of Cape Colony and legislative capital of the South African Union, 30 mi. n. of the Cape of Good Hope. The city contains numerous parks and many beautiful buildings, among which are the Houses of Parliament, the Supreme Court, the South African Museum, the cathedral, a number of churches and mosques and a synagogue. There are also numerous educational institutions, including colleges and an examining university, besides the Cape Observatory. The harbor is protected by a breakwater over four thousand feet long, and the docks cover an area of sixteen acres. Cape Town is a port of call for nearly all vessels passing around the Cape of Good Hope, and in commercial importance it is surpassed in rank only by Port Elizabeth. Its trade is with nearly all ports on the Atlantic and Indian oceans. It is connected by railway with all the important towns of Cape Colony and surrounding provinces and is the southern terminus of the Cape-to-

Cairo railway. Cape Town was founded in 1652 by the Dutch and was held by them until 1806, when it was taken by England. Population, including the suburbs, estimated at 167,000.

Cape Verde, *vurd,* the extreme west point of Africa, between the Senegal and the Gambia, discovered by Fernandez in 1445. A group of baobab trees, with their green tops showing on the white coast, is said to have suggested the name.

Cape Verde Islands, a group of ten or fifteen volcanic islands and rocks in the Atlantic, w. ot Africa, belonging to Portugal. Their area is 1480 square miles. They produce rice, maize, coffee, tobacco, sugar cane, physic nuts and various fruits. Most of the inhabitants are negroes or of mixed race. The chief town is Praya, a seaport on Santiago, the largest island. Porto Grande, on Sao Vicente, is a coaling station for steamers and has the best harbor in the group. Population in 1900, 147,425.

Cape Wrath, the northwest extremity of Scotland, in Sutherlandshire. It is a pyramid of gneiss bearing a lighthouse, the light of which is 400 feet above sea level.

Ca'pias (Latin, you may take), the name given in law to a common-law writ requiring an officer to arrest a person and hold him in custody. The capias is rarely issued, having been superseded by other statutory writs.

Cap'illa'ries, in anatomy, the fine blood vessels which connect the arteries with the veins. Some of the capillaries are so small that only one blood corpuscle at a time can pass through. They are largest in the marrow of the bones and smallest in the brain, and in certain organs they divide and subdivide, forming a network. The capillary walls are thin and composed of but one layer of tissue; through them the blood receives waste products and gives up nutritious material. The blood in the capillaries of the lungs receives oxygen and gives up carbonic acid.

Cap'illar'ity, the tendency of liquids in small tubes and porous bodies to rise above the level of the liquid in a vessel surrounding the smaller tube. Capillarity can be shown by placing small glass tubes or straws in a vessel of water colored with a little ink. If the tubes are of different size they will show that the liquid rises highest in the smallest tube. By innumerable tests in this manner was proved the principle that the smaller the tube the stronger the capillarity. Capillarity is due to the adhesion of the liquid to the walls of the tube or the vessel, and a close examination will show that the surface of a liquid in a vessel is concave, the portion touching the walls of the vessel being raised above that in the center. When mercury is confined in a glass vessel, the principle of capillarity is reversed, as there is no adhesion, and the surface of the mercury is convex. The part which capillarity plays among natural phenomena is a very varied one. By it the fluids circulate in the porous tissues of animal bodies, the sap rises in plants and moisture is absorbed from air and soil by the foliage and roots. For the same reason a sponge or lump of sugar, or a piece of blotting paper, soaks in moisture, and the oil rises in the wick of a lamp.

Cap'ital, in trade, the term applied, as the equivalent of "stock," to the money, or property convertible into money, used by a producer or trader for carrying on his business; in political economy, that portion of the produce of former labor which is reserved from consumption for employment in the further production of wealth. In the latter sense, it is commonly divided into two main classes—circulating capital and fixed capital. *Circulating capital* comprises those forms of capital which require renewal after every use in production, being consumed (absorbed or transformed) in a single use; for instance, raw materials. *Fixed capital,* on the other hand, comprises every form of capital which is capable of use in a series of similar productive acts; for example, machinery and tools. From the ordinary economic point of view capital is conveniently limited to material objects directly employed in the reproduction of material wealth, but from the higher social point of view many things less immediately concerned in productive work may be regarded as capital. Thus, Adam Smith includes in the fixed capital of a country "the acquired and useful abilities of all the inhabitants"; and the wealth sunk in prisons, education and other uplifting institutions plays, ultimately, a scarcely less important part in the production than that invested in directly productive machinery. The return which capital yields in production is termed *interest,* to distinguish it from *rent,* the return for the use of land, and *wages,* the return to labor.

During recent years capital has shown a marked tendency to concentration; or, more accurately, the *management* of capital has tended to pass into a few hands. This has served to draw more sharply the distinction between the capitalist and laboring classes and to increase their feeling of antagonism. Although most economists declare the interests of both sides to be ultimately identical, the crushing out of small owners and the fear of the absolute power to fix both the price of labor and of product which may, by absence of competition, come into the hands of the great owners, have created a strong opposition to the centralizing of capital. It has the advantage, however, of making possible a lowered cost of production and of preventing wasteful competition. Various schemes for the public ownership and direction of capital are the inevitable outgrowth of the condition of dissatisfaction. See SOCIALISM; TRUSTS; TRADES UNIONS; INTEREST; RENT; WAGES.

Capital, an architectural term, usually restricted to the upper portion of a column, the part resting immediately on the shaft and separating it from the entablature, or other portion of the structure above the pillar In classic architecture, each order has a peculiar form of capital, which is, more than anything else, its distinguishing characteristic. Belonging to the three orders of Grecian architecture, respectively, are the *Doric*, the *Ionic* and the *Corinthian* capitals, of which the first was later modified by the Romans in their *Tuscan* columns, and the last two combined in the *Composite* order. From these developed the Gothic capitals, which are widely varied in appearance. See COLUMN.

Capital Pun′ishment, in criminal law, punishment by death. Formerly it was the ordinary form of punishment for felonies of all kinds; but a more accurate knowledge of the nature and remedies of crime, a more discriminating sense of degrees in criminality and an increased regard for human life have latterly tended to restrict, if not to abolish, the employment of the penalty of death. In 1765 in England there were 160 capital offenses on the statute books. The work of practical reform, inspired by Beccaria's treatise on *Crimes and Punishments*, was initiated in 1770 by Sir William Meredith, but the modifications secured were few, owing to the opposition of the House of Lords, which continued down to 1832 to oppose systematically all attempts at criminal law reform. The reform was vigorously upheld by Sir Samuel Romilly, and after him by Sir James Mackintosh. After the passage of the Reform Bill in 1832, changes were rapid, until in 1861 only four capital crimes remained—setting fire to the royal dockyards or arsenals, piracy with violence, treason and murder. At the present time the last of these may be regarded as the only capital crime in England and Scotland. In several other European countries—Sweden, Denmark, North Germany, Bavaria, Austria—there is even a greater unwillingness to enforce capital punishment than is found in Great Britain, though the penalty remains upon the statute books. In Belgium there has been no execution since 1863. In Switzerland capital punishment was abolished in 1874, and though the right of restoring it was allowed to each canton, in consequence of an increase of murders, only 7 out of a total of 22 have availed themselves of it. In Rumania it was abolished in 1864; in Holland in 1870, and it has also been discontinued in Portugal. In several states of the Union—Michigan, Wisconsin, Rhode Island and Maine—imprisonment for life has been substituted for murder in the first degree; in the remainder capital punishment is retained, though the experiment of its abolition was made for a short time in New York and Iowa.

The manner of inflicting the punishment of death has varied greatly, the methods of olden times being often cruel and barbarous. In modern times among civilized nations, public opinion is strongly disposed to discountenance the death punishment by any but simple means. In Great Britain and in most parts of the United States, the method of execution is by hanging, but in a few states, such as New York, Ohio, Colorado and Massachusetts, electricity is employed. In Germany and France the sword and the guillotine are the usual means; in Spain, strangulation by means of the *garrote*, a sort of iron collar tightened by a screw. Since 1868 the law of England has required all executions to take place privately within the prison walls, and this system was adopted in 1877 by Germany and widely in the United States. Capital punishment cannot be inflicted, under the laws of most modern nations, upon persons who are insane. In military law, sentence of death may be passed for various offenses, such as sedition, violence, gross neglect of duty, desertion, assault upon superior officers or disobedience to lawful commands.

Capitals, the large letters which are used in writing and printing. They are used most commonly as the initial letters of certain words, or of all words in certain positions. During the Middle Ages, as well as in ancient times, there was no distinction between different kinds of letters, but the custom of illuminating the first letter of a book or of a chapter gradually gave rise to a more general use of large letters. In almost all countries, sentences and proper names begin with capital letters. In German every noun begins with a capital, and this was formerly the rule in English. Unlike most other languages, adjectives which are derived from proper names are in English begun with capitals, as *French, Canadian.*

Capitol, the citadel of ancient Rome, standing on the Capitoline Hill, the smallest of the seven hills of Rome. It was planned by Tarquinius Priscus, but was not completed till after the expulsion of the kings. At the time of the civil commotions under Sulla it was burned down, and it was rebuilt by the Senate. It suffered the same fate twice afterward and was restored by Vespasian and by Domitian, who instituted there the Capitoline games. The important structures were the great temple of Jupiter; the Tabularium, a library containing the archives, and the temple of Juno Moneta. The Piazza di Campidoglio occupies the space between the summits of two hills, and it is surrounded on three sides by palaces, after the design of Michelangelo. On the east side is the museum of the capitol, which contains one of the finest collections of sculpture in Rome, some of the celebrated pieces being *The Dying Gladiator* (*Gaul*), *The Marble Faun* of Praxiteles and the *Capitoline Venus*; on the north side is the Palace of the Senators, and on the west is the Palace of the Conservators. In the center of the piazza is a bronze equestrian statue of Marcus Aurelius, one of the finest ancient works of its kind.

The name of *capitol* is also given to the edifice in Washington where Congress assembles, and in the states, to buildings, sometimes called statehouses, where the legislatures meet. See WASHINGTON, subhead *Public Buildings and Institutions.*

Cappadocia, *kap′pa do′she ah,* in antiquity, one of the most important provinces in Asia Minor, the greater part of which is included in the modern province of Karaman. Its boundaries varied greatly at different times. It was conquered by Cyrus and was ruled by independent kings from the time of Alexander the Great until 17 A. D., when it became a Roman province.

Capri, *kah′pre,* (ancient Capreae), an island belonging to Italy. in the Gulf of Naples, 5 miles long and 2 miles broad, rising to the height of about 1900 feet and everywhere well cultivated. The inhabitants are occupied in the production of oil and wine, in fishing and in catching quails at the seasons of their migrations. The leading towns are Capri in the east and Anacapri in the west, situated on the summit of a rock, and accessible by a stair of 522 steps. The emperor Tiberius spent here the last seven years of his life. The ruins of his palaces are still extant, and other ruins are scattered over the island. There is here a remarkable cavern, called the Grotto of the Nymphs, or the Blue Grotto. Population, 6206.

Cap′ricor′nus, (the goat), a constellation of the southern hemisphere and the tenth sign of the zodiac, marking the winter solstice about December 21. Capricornus was represented by (♑), the figure of a goat, or the figure having the fore part like a goat and the hind part resembling a fish. Capricornus is the name given to the southern tropic. See TROPICS.

Caprivi, *kah pre′ve,* GEORG LEO, Count von (1831–1899), second chancellor of the German Empire. He entered the Prussian army in 1849, served in the war of 1866 and the Franco-Prussian War and was advanced rapidly in rank. In 1882 he was given command of the third army division, and from 1883 to 1888 he was at the head of the admiralty, in which position he reorganized the navy. He held command of the tenth army corps, stationed in Hanover. In 1890 he became Bismarck's successor as chancellor, and proved himself a man of great strength and of much executive ability.

Cap′sicum, a genus of annual. shrubby plants with a wheel-shaped corolla, projecting and converging stamens and a many-seeded berry. They are chiefly natives of the East and West Indies, China, Brazil and Egypt, but they have spread to various other tropical or subtropical countries, being cultivated for their fruit, which at times reaches the size of an orange, is fleshy and variously colored and very sharp to the taste. The fruit or pod is used for pickles and sauces, and also is valuable medicinally. Cayenne pepper and chili, the favorite condiment of the Mexicans, is prepared from species of capsicum. (See illustration on next page.)

Cap′stan, a device used on ships for raising the anchor and other heavy weights. The old-fashioned capstans were made of wood, but those now in use are made of iron and steel. A capstan consists of an upright revolving post, which turns upon a spindle. It is usually concave in the middle, to give space for winding the rope, and may have large metal teeth, which grip the links of an anchor chain. The tip or crown contains holes or mortises, in which levers are inserted for turning the capstan. The levers are usually long enough to enable two or three men to work upon each. On steamships capstans are operated by steam power or electricity.

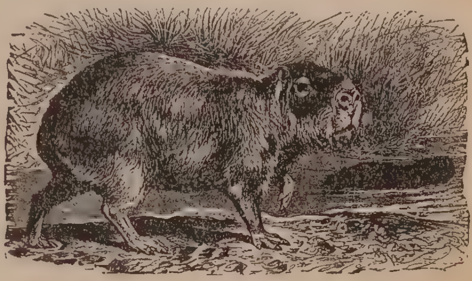
Cap′ua, a fortified city of Italy, in the province of Caserta, in a plain 18 mi. n. of Naples, on the Volturno. It is the residence of an archbishop and has a cathedral. The ancient city was situated 3½ miles southeast of the modern town. The site is now occupied by the city Santa Maria di Capua Vetere. The ancient Capua was of such extent as to be compared to Rome and Carthage. It was a favorite place of resort of the Romans, on account of its agreeable situation and its healthy climate, and many existing ruins, including an amphitheater, attest its ancient splendor. Population, 12,390.

CAPSICUM

Capuchin, *kap u sheen′*, **Monkey,** a name given to various species of South American monkeys, the hair of whose heads is so arranged that it has the appearance of a capuchin's cowl.

Capuchins, monks of the order of Saint Francis, so called from the capouch, or hood, which is the distinguishing badge of the order. They are clothed in brown or gray, go barefooted and never shave their beards. According to the laws of the order the monks must live by begging and may use no gold, silver or silk about their altars. The members of this order are most numerous in Austria. There are convents in the dioceses of Milwaukee and Green Bay, Wis., New York, N. Y., and Leavenworth, Kan.

Capybara, *kah′pe bah′ra,* a species of rodent, sometimes known by the name of the water hog. It attains the length of about three feet; it has a very large and thick head; a thick body, covered with short, coarse, brown hair, and short legs, with long feet. It has no tail. The capybara is common in several parts of South America, and particularly in Brazil. It feeds on vegetables and fish, which it catches somewhat in the manner of the otter. In the water the animal is perfectly at home. Its flesh is edible.



CAPYBARA

Car′acal, a species of lynx, native of northern Africa and southwestern Asia. It is about the size of a fox and is usually of a deep-brown color, having tufts of long black hair which terminate the ears. It possesses great strength and fierceness.

Car′acal′la, Baths of, celebrated baths at Rome, built in 212 A. D. They consisted of a group of buildings, the central one of which contained large halls surrounded by gardens, the whole covering 129,600 square yards. The thick walls were covered with marble and the floors were mosaic. The buildings were lavishly adorned with statuary and other works of art, many of which have been preserved. Water was supplied by the Marcian Aqueduct, and accommodations were made for 1500 guests.

Caracas, *ka rah′kas,* a city of South America, capital of Venezuela, situated in a fine valley about 3000 feet above the Caribbean Sea, connected by railway with the port La Guayra, which is about ten miles distant. It is regularly laid out, and has some good buildings, including a cathedral, a university, the federal palace and other government buildings. It has various parks and gardens, fair gas and water supply, telephones and tramways. The export trade is in cacao, coffee and tobacco. In 1812 the city was in great part destroyed by an earthquake, and nearly 12,000 persons were buried in the ruins. Population, 72,430.

Car′amel, the brown mass which is produced when cane sugar is heated. It is used in cooking as a coloring and flavoring ingredient and in giving a brown color to spirits and other liquids. The name is also applied to a certain preparation of candy.

Car′at, a weight of 3.17 troy grains, used by jewelers in weighing precious stones and pearls. It is divided into 4 *carat grains*, which, in turn, are divided into 2, 4, 8 or 16 parts for more accurate measurements. The term is also used to express the proportionate fineness of gold, a carat being $\frac{1}{24}$ of unit weight of metal. So, if $\frac{18}{24}$ of an alloy is pure gold, it is said to be "18 carats fine," and when it is "24 carats fine" it is pure, or "solid gold."

Caravaggio, *kah′ra vah′jo,* MICHELANGELO AMERIGI (1569–1609), a celebrated Italian painter, born in Caravaggio. In his youth he prepared plaster for the artists; while engaged in this work he acquired the desire to become a painter. He studied at Milan and Venice, where he was influenced by the works of Giorgione, and later went to Rome, where he found a patron in Cardinal del Monte. The turbulent disposition of Caravaggio involved him in frequent quarrels, in one of which he killed a companion at Rome. He was forced to flee and went to Naples and Malta. Caravaggio was the head of the naturalists and exerted a marked influence on the development of modern art. His paintings, though sometimes coarse and fierce, display grandeur and power. His most celebrated works are *Entombment of Christ, Saint Sebastian* and *Supper at Emmaus.*

Car′avan, a Persian word used to denote the large companies which travel together across the Asian or African deserts, for the sake of security from robbers. Most numerous of these caravans are the associations of merchants; but caravans of pilgrims, going from Cairo or Damascus to Mecca, cross the deserts every year. Camels are used as a means of conveyance, on account of their remarkable powers of endurance.

Car′avel, the name of different kinds of vessels; particularly, a small ship used by the Spaniards and Portuguese in the fifteenth and sixteenth centuries for long voyages. It was narrow at the poop, wide at the bow and carried a double tower at its stern and a single one at its bow. It had four masts and a bowsprit, and the principal sails were lateen sails. It was in command of three such caravels that Columbus crossed the Atlantic and discovered America.

Car′away, a common biennial plant, with a tapering fleshy root, a striated, furrowed stem and white or pinkish flowers. It produces a well-known seed used by confectioners and bakers.

Car′bohy′drate, an organic compound, such as starch and cellulose, containing carbon and the elements of water.

Carbol′ic Acid, Phenic Acid or **Phenol,** an acid obtained from coal tar. It is, when pure, a colorless crystalline substance, but it is usually found as an oily liquid, colorless, with a burning taste and the odor of creosote. Carbolic acid is now much employed as a healing agent and disinfectant. It may be taken internally, but its principal use in medicine is as an external application to unhealthy sores, to compound fractures and to abscesses after they have been opened, for it coagulates and forms a crust impermeable to air and to the organic germs floating in the atmosphere.

Car′bon, one of the elements, existing uncombined in three forms, as charcoal, as graphite, or plumbago, and as diamond. The diamond is the purest form of carbon; in the different varieties of charcoal, in soft coal and in anthracite, it is more or less mixed with other substances. Pure charcoal is a black, brittle, light and inodorous substance. It is usually the remains of some vegetable body, from which all the volatile matter has been expelled by heat; but it may be obtained from most organic matters, animal as well as vegetable, by ignition in closed vessels. The compounds of this element are more numerous than those of all the other elements taken together. With hydrogen, especially, it forms a very large number of compounds, called hydrocarbons, which are possessed of the most diverse properties, chemical and physical. With oxygen, carbon forms only two compounds, but union between the two elements is easily effected (See CARBONIC-ACID GAS). It is one of the regular and most characteristic constituents of both animals and plants. See DIAMOND; CHARCOAL; GRAPHITE; BONE BLACK; COKE.

Carbonari, *kahr′bo na′re,* (charcoal burners), the name of a secret political society, founded in Italy during the reign of Murat in Naples. Its original object was the expulsion of the French and the establishment of a democratic government. Later, the strength of the society was turned against the Bourbon rulers of Italy.

Car'bonates, compounds formed by the union of carbonic acid with a base, as the carbonate of lime and the carbonate of copper. Carbonates are an important class of salts, many of them being extensively used in the arts and in medicine.

Car'bondale, Pa., a city of Lackawanna co., 16 mi. n. e. of Scranton, on the Lackawanna River and on the Erie and other railroads. It is in the center of an important anthracite coal field, and the chief industry is mining. There are also silk mills, foundries and machine shops. It has a public library, an emergency hospital and a park in the center of the city. The place was settled in 1824 and was incorporated in 1851. Population in 1910, 17,040.

Carbon Disulphide, *di sul'fide*, or **Carbon Bisulphide,** a compound of carbon and sulphur, which is known as a thick, colorless liquid. When pure, it has rather a pleasant odor, but ordinarily, owing to the presence of impurities, it is very disgusting. It evaporates rapidly, and by passing a current of air over it very low temperature may be obtained in its use. It is a strong solvent for such substances as india rubber, gutta-percha, the resins and phosphorus.

Carbon'ic-ac'id Gas or **Carbon Dioxide,** a gaseous compound of carbon and oxygen, colorless, without smell, twenty-two times as heavy as hydrogen, and existing in the atmosphere to the extent of 3 volumes in 10,000. It cannot support combustion and is poisonous to animals, although not so powerful as carbonic oxide. It is set free from fermenting liquors and from decomposing vegetable and animal substances, and is largely evolved from fissures in the earth, constituting the *choke damp* of mines. Its solution in water has a pleasant, sour, biting taste, and aerated beverages of all kinds—beer, champagne and carbonated mineral waters—owe their refreshing qualities to its presence, for though poisonous when taken into the lungs, it is agreeable when taken into the stomach. *Soda water* is water charged with carbon dioxide. Since it does not support combustion, it is used as a fire extinguisher when put up in iron cans under pressure. This gas is formed and given out during the breathing of animals, and in burning, from the oxidation of carbon in the fuel. It exists in large quantities in all limestones and marbles. Plants absorb carbonic-acid gas from the air and transform it by the aid of light into plant tissue. From its weight it has a tendency to subside into low places, vaults and wells, rendering some low-lying places and many caves uninhabitable.

Liquid Carbonic Acid. Carbon dioxide, when subjected to a pressure of about 450 pounds to the square inch and a temperature of 5° F. below zero, is easily changed to liquid. This acid is manufactured on a large scale by forcing the gas into steel cylinders by means of a powerful pump, until the pressure becomes sufficient to change the gas into liquid. The large quantities of carbon dioxide produced in the process of brewing are now saved and used in this way. Liquid carbon dioxide is also made directly in factories established for the purpose. It is used in the making of soda water and other effervescent drinks.

Carbon'ic Ox'ide, a substance obtained by passing carbonic acid over red-hot fragments of charcoal, contained in a tube of iron or porcelain, and also by several other processes. It is a colorless, inodorous gas, having neither acid nor alkaline properties, is very poisonous and burns with a pale blue flame.

Carbonif'erous Period, the last division of the Paleozoic era, named from the formation of the coal measures which took place at this time. East of the Rocky Mountains North America was probably all above the sea, though during the early part of the period what forms the great bituminous coal bed of the Mississippi basin may have been the bottom of a shallow lake. In all continents marshes and swamps became choked with a rich growth of vegetation, and during the period there were numerous elevations and subsidences of the land, as shown by the large number of veins found in the coal measures. The vegetation included rushes, club mosses, ferns and lepidodendrons, which are now extinct, all of which grew to a great size. Ferns often formed trees having trunks more than twenty feet in height, and club mosses attained a height of seventy-five or one hundred feet. It was from these plants that most of the coal was formed, and their universal distribution, as they are found in all coal measures, shows that the conditions of climate and moisture were uniform throughout the earth. The animal life of the period included insects, scorpions, corals, amphibians, crinoids, mollusks and fishes. See Coal; Paleozoic Era.

Carboniferous System, in geology, the great group of strata of rocks which lie between the Devonian system below and the Triassic system above. The rocks take their name from the quantities of coal, shale and other carbonaceous matter contained in them. They include the coal measures, millstone grit and mountain limestone, the first being uppermost and containing the chief coal fields that are worked. Iron ore, limestone, clay and building stone are also yielded abundantly by the carboniferous strata, which are found in many parts of the world, often covering large areas. See Carboniferous Period; Coal; Devonian System; Triassic System.

Car′borun′dum, an artificial abrasive, made by smelting sand and carbon in an electric furnace. It closely resembles corundum and is a valuable polishing material. Carborundum is made by mixing in proper proportions coke, sand, sawdust and a small quantity of salt, and smelting the mixture in an electric furnace specially constructed for the purpose. The heat required is more intense than that necessary for any other known process, and the time for converting the mixture into carborundum is about thirty-six hours. The only factory for this manufacture is at Niagara Falls. Carborundum is used in the place of corundum and emery and also for glazing brick and for the lining of furnaces that are subjected to great heat. It is made extensively at Niagara Falls. See Abrasives; Corundum; Emery.

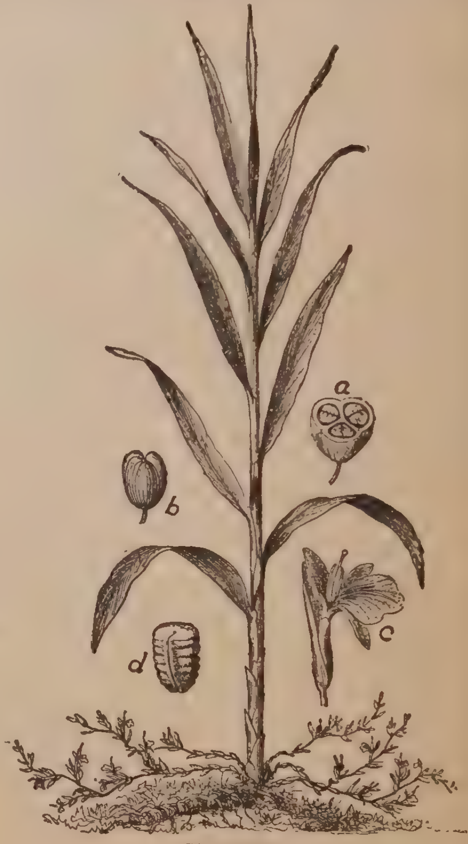
Car′buncle, a beautiful gem of a deep red color with a mixture of scarlet, found in the East Indies. When held up to the sun it loses its deep tinge and becomes the color of a burning coal. The carbuncle of the ancients is supposed to have been a garnet.

Card, an instrument for combing, opening and breaking wool, flax and other fibers, freeing them from the coarser parts and other matter. A card is made by inserting bent teeth of wire in a thick piece of leather, and nailing this to an oblong piece of board, to which a handle is attached. But wool and cotton are now generally carded in mills by teeth fixed on a wheel moved by machinery.

Cardamom, *kahr′da mum,* the dried fruits and seeds of different species of plants called cardamoms. They have a sharp, aromatic taste. Those recognized in America as *true* or *official cardamoms* and known in commerce as *Malabar cardamoms,* are the produce of a plant of the mountains of Malabar and Canara.

Cardenas, *kahr′da nas,* a seaport on the north coast of Cuba, 103 mi. e. of Havana, with which it is connected by rail. It is one of the principal commercial centers of the island, the chief exports being sugar, molasses and coffee. Population, 21,950.

Car′diff, a seaport of Wales, situated at the mouth of the Taff River, 170 mi. w. of London. The important buildings are the Castle, erected in the eleventh century; the Church of Saint John, built in the thirteenth century, and a public library. The leading industries are shipbuilding and the manufacture of iron, steel and tin plate. The town is located near large coal and iron mines and is an important commercial center. The docks are extensive and at high tide can be reached by the largest vessels. Population in 1901, 164,400.



CARDAMOM
a, cross section of fruit; *b*, fruit; *c*, flower, *d*, seeds.

Car′dinal, a dignitary of the Roman Catholic Church, next in rank to the pope. The cardinals, or members of the Sacred College, are appointed by the pope and help him in the management of the affairs of the Church. The number in the Sacred College may vary, though it was fixed at seventy by Sixtus V in 1586. There are but few English-speaking cardinals, the greater number being Italians. The first cardinal of the United States was McCloskey, 1875. On the death of the pope the Sacred College elect his successor, who must be one of their own number.

The insignia of a cardinal are the cardinal's red hat, given by the pope, but not worn; the *biretta*, or red cap· the sapphire ring; the purple cassock; the miter of white silk.

Cardinal Bird or **Redbird**, a showy North American finch, with fine red plumage and a crested head. A black patch is conspicuous on each side of the bill. The cardinal whistles beautifully, and his clear, ringing note is a great favorite, especially in the Southern states, where the bird is often kept in captivity. It nests occasionally as far north as northern Illinois, and every spring is seen and heard with unceasing delight. The cardinal is easily tamed, and in city parks it often learns to come to the call of people who feed it with nuts. See BIRDS; also FINCH.

Cardinal Flower, the name commonly given to one of the lobelias, because of its large, very showy and intensely red flowers. It is a native of low, swampy places in the United States and is much cultivated in gardens in Britain. See LOBELIA.

Cards, PLAYING, pasteboard cards, bearing printed symbols and used for the purpose of playing games of chance. They are of ancient origin, being used probably by the Egyptians, the ancient Jews and the peoples of the Orient before the Christian era. They were probably introduced into Europe by the Crusaders or by the Moors. The set of cards commonly used in Europe and America is known as a *pack* or a *deck* and consists of fifty-two cards, in four *suits* or classes, known as *clubs, spades, diamonds* and *hearts,* distinguished by the shape of the *spots,* or *pips,* upon their faces, and by colors. Each suit contains thirteen cards, the first ten distinguished by the number of spots or pips; the last three, known as *face cards* and called *Jack* or *Knave, Queen* and *King,* respectively, bearing fantastic representations of human characters corresponding to these titles. Cards are used according to many sets of rules, for which see articles upon the common games, including WHIST; EUCHRE; CASINO; CRIBBAGE; DRAW POKER; SKAT; SOLITAIRE.

Ca'rey, HENRY (1696–1743), a British composer, dramatist and poet. He wrote the words and music of many popular songs, including *Sally in Our Alley* and, perhaps, *God Save the King.*

Carey, HENRY CHARLES (1793–1879), an American political economist, born in Philadelphia. His father, Matthew Carey, was a publisher and political economist. He gave his son a liberal education, and at the age of eight the boy entered his father's bookstore. He was successful in business and made a study of economic questions. Though at first a free trader, he became the foremost literary supporter of protection. He was the author of numerous economic works, the principal one of which, *Principles of Political Economy* (1840), was favorably received throughout the world. He was a member of the Republican party, supported the Union during the Civil War and was a trusted adviser of Lincoln and Chase. At his death he gave his valuable library to the University of Pennsylvania.

Carey, WILLIAM (1761–1834), a Baptist missionary and oriental scholar, born near Northampton, England. He began life as a shoemaker, but during his apprenticeship studied by himself, and when twenty-five years of age was appointed minister of a Baptist congregation. In 1793 he was sent as the first Baptist missionary to India and he devoted the remainder of his life to work in that country. He mastered the Hindu language, became connected with the Danish colony at Serampur and established a publishing house, which in less than thirty-five years issued over 200,000 Bibles or portions of the Bible, in over forty different oriental languages. Carey became a noted Sanskrit scholar and prepared a Sanskrit grammar and dictionary, as well as similar works on other oriental languages, and for thirty years he was professor of oriental languages at Fort William College, Calcutta.

Car'ib, the race of indians originally inhabiting the West India Islands and the northern coast of South America, now practically extinct. They were a fierce and warlike race who traveled about in war canoes, and who were overcome by the Spaniards only after the fiercest of fighting. They protected their bodies from the sun by the use of paint and oil, but wore no clothing. They were man-eaters, and from the Latin form of their name the word cannibal is derived.

Car'ibbe'an Sea, that portion of the North Atlantic Ocean lying between the coasts of Central and South America and the West India Islands. It communicates with the Gulf of Mexico by the Yucatan channel. The southern shores are rocky and high, but navigation is open. The chief arms are the gulfs of Honduras, Darien and Venezuela. The length of the Caribbean Sea from east to west is 1700 miles.

Car'ibou, the American reindeer, which is now rarely found south of Canada, but which was formerly common as far south as Connecticut. Caribou roam about in the summer, but in winter they gather together in herds, feeding on winter berries and the leaves of shrubs. Their large hairy hoofs enable them to travel easily in the snow. They have large antlers, one branch of which extends over the forehead in front. See REINDEER.

Caricature, *kar'i ka ture'*, a grotesque picture or representation of a person or thing, the peculiarities being so exaggerated as to appear ridiculous. The art is an old one and was practiced by the Egyptian and Assyrian artists, as well as by the Greeks and Romans. It was popular among all the European nations during the Middle Ages. The invention of printing made it possible to circulate caricatures more freely, but in many countries there was so little liberty allowed by the rulers that the art could not flourish. With the greater freedom of the press the growth has been more rapid. In the present day most of the daily papers and many of the magazines publish caricatures, which influence public opinion almost as much as that which is written. In the United States, *Puck*, *Judge* and *Life*; in England, *Punch*; in France, *Charivari*; in Germany, *Fliegende Blatter* are periodicals devoted to caricature and humor. The following is a list of some of the world's famous caricaturists: of France, Callot, Daumier, Vernet, Gavarni and Cham; of England, Hogarth, Gilroy and Cruikshank; of the United States, Opper, Davenport, Nast, Bush, Bartholomew (Bart) and McCutcheon.

Carleton, *kahrl'ton,* SIR GUY (1724–1808), a British soldier and colonial governor. He served during the French and Indian Wars in America, in 1766 was appointed lieutenant governor, and in 1775 governor, of Quebec. Later he took supreme command of the British forces in Canada, successfully repelled the American attacks in the early years of the Revolution and was raised to the rank of lieutenant general. In 1777 he was superseded by Burgoyne, but at the close of the war succeeded Sir Henry Clinton as commander in chief. For his services he was created Baron Dorchester by the king and was granted a pension of £1000 a year. From 1786 to 1796 he was again governor of Quebec, proving a popular and able administrator.

Carleton, WILL (1845–   ), an American author, born in Hudson, Mich. He graduated at Hillsdale College in that state and soon afterward began to lecture in various parts of the United States and Canada. His best-known works are poems of domestic life, as *Farm Ballads, Farm Legends, Farm Festivals, City Ballads* and other poems. They possess both vigor and pathos and have attained a wide popularity on both sides of the Atlantic.

Carleton, WILLIAM (1794–1869), an Irish novelist. His education commenced at a hedge-school and terminated with two years' training in an academy. Afterward he went to Dublin to try his fortune, and there in 1830 was published his *Traits and Stories of the Irish Peasantry*, which met with great success. Among his novels are *Fardorougha the Miser, Valentine M'Clutchy, The Black Prophet* and *Willy Reilly*. Carleton was given a government allowance of $1000 per annum several years before his death. He has been called "one of the truest, the most powerful and the tenderest delineators of Irish life."

Carlisle, *kahr lile'*, a city in England, capital of the county of Cumberland, 52 mi. w. of Newcastle. It has a splendid medieval cathedral, which is only partially preserved. The castle built by William Rufus is now used as barracks. The manufactures include cotton fabrics, hats and iron. Carlisle was originally a Roman station, was destroyed by the Danes in the ninth century and was rebuilt by William Rufus. Population in 1901, 45,480.

Carlisle, PA., the county-seat of Cumberland co., 18 m. w. by s. of Harrisburg, on the Gettysburg & Harrisburg and the Cumberland Valley railroads. The borough is in a productive farming region, is laid out with wide streets and has several fine public buildings. A large United States Indian training school is located here, and it is also the seat of Dickinson College and of Metzger Institute for girls. The principal manufactures are chains, frog switches, shoes, flour, paper boxes and carpets. Mount Holly Springs is a beautiful summer resort in the near-by mountains. During the Whisky Insurrection of 1794, the militia had their headquarters here, and on July 1, 1863, the place was bombarded by the Confederates. Population in 1910, 10,303.

Carlisle, John Griffin (1835–1910), an American statesman, born in Kentucky. He became a lawyer, served several terms in the state legislature, from 1871 to 1875 was lieutenant governor of the state and in 1877 took his seat in Congress. From 1883 to 1889 he served as speaker of the House of Representatives, and in 1890 he was elected senator. He resigned in 1893 to become secretary of the treasury in President Cleveland's cabinet. In this position Mr. Carlisle gained fame as an advocate of the gold standard, and for his connection with the sale of bonds to replenish the treasury's gold reserve. In 1897 he resumed the practice of law in New York.

Carlos I (1863–1908), king of Portugal, was the son of King Luiz I and Queen Maria Pia, daughter of King Victor Emmanuel II of Italy. In 1886 he married Marie Amelie, daughter of the Duke of Orleans. In 1889 he ascended the throne. On Feb. 1, 1908, Carlos and his eldest son were shot by revolutionists while driving in Lisbon. Manuel, his second son, ascended the throne, assuming the title of Manuel II.

Carlos de Bourbon, Don (1788–1855), a pretender to the Spanish crown, the second son of Charles IV. Before the birth of Maria Isabella, he had been regarded as the heir of his brother, Ferdinand VII, and when, after the death of Ferdinand, Maria Isabella was declared queen, Don Carlos attempted to assert his right to rule by reason of the Salic Law (See Salic Law). Until 1839, when he was obliged to flee from the country, he kept up his struggle. In 1845 he resigned his rights to his sons, in whose favor there was an insurrection in 1860.

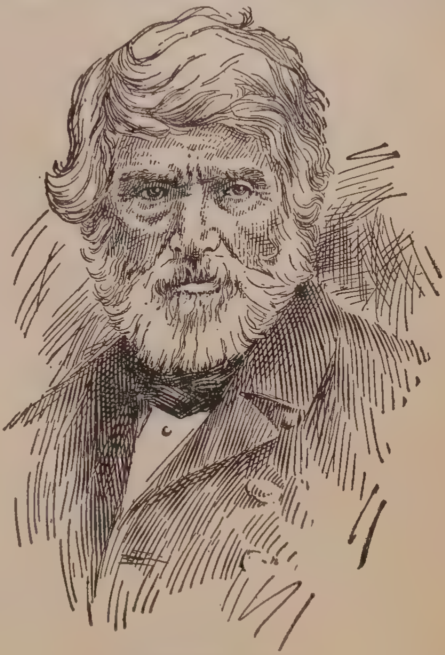
Carlovingians, *kahr'lo vin'je anz.* See Carolingians.

Carlsbad, *kahrls'baht.* See Karlsbad.

Carlsruhe, *kahrls roo'e.* See Karlsruhe.

Carlstadt, *kahrl'staht,* Andreas Rudolf Bodenstein (1480–1541), a German reformer, one of Luther's warmest supporters, excommunicated with him. In 1524, however, he began an opposition to Luther which resulted in the separation of the Calvinists and Lutherans.

Carlyle, *kahr lile',* Thomas (1795–1881), eminent Scottish writer, born at Ecclefechan, Dumfriesshire. He was intended for the Church and was carefully educated with that object in view. In his fifteenth year he was sent to the University of Edinburgh, where he developed a strong taste for mathematics. Having renounced the idea of becoming a minister, he became on his graduation a teacher; but he disliked this work and in 1818 removed to Edinburgh, where he supported himself by literary work. His career as an author may be said to have begun with the issue in the *London Magazine* of his *Life of Schiller,* which was enlarged and published separately in 1825. In 1824 he published a translation of Legendre's *Geometry,* with an essay on proportion, by himself, prefixed, and in the same year appeared his translation of Goethe's *Wilhelm Meister.* His *Specimens of German Romance* was published in 1826, the year in which he married Miss Jane Baillie Welsh.



THOMAS CARLYLE

Although there is no doubt that Carlyle and his wife were genuinely and deeply attached to each other, their life was far from peaceful, owing to Carlyle's temper and his wife's critical nature. After their marriage they lived for a time in Edinburgh, and then withdrew to Craigenputtock. Here he wrote a number of critical and biographical articles for various periodicals; and here, too, he wrote *Sartor Resartus* (the tailor mended), the most original of his works. The publication of *Sartor* soon made Carlyle famous. He removed in 1834 to London, and three years later he brought out his *French Revolution,* a vivid dramatic picture of that great movement.

During the years that followed Carlyle delivered several series of lectures, the most important of which is *Heroes and Hero-worship.* *Chartism,* published in 1839, and *Past and Present,* in 1843, were small works bearing on the affairs of the time. In 1845 appeared his *Oliver Cromwell's Letters and Speeches, with Elucidations,* and in 1850 his *Latter-day Pamphlets* came out. He next wrote a life of his friend John Sterling, published in 1851. The largest and most laborious work of his life, *The History of Frederick the Great,* next appeared, the first two volumes in 1858, the second two in 1862 and the last two in 1865; and after this time little came from his pen. In 1866, having been elected lord rector of Edinburgh University, he delivered an installation address to the students on the *Choice of Books.* While still in Scotland the sad news reached him that his wife had died suddenly in London. For the rest of his years he lived much in retirement, and he died in 1881 in Chelsea. Carlyle's *Reminiscences and Life,* with the *Letters of Jane Welsh Carlyle,* were published by James Anthony Froude, Carlyle's literary executor, and for a time Carlyle's reputation suffered greatly by some of the revelations contained in these works.

Carlyle's intense hatred of sham was expressed in the fiercest satire, and he attempted to drive, rather than to lead, men toward the truth he loved. The style of his works, his disjointed, rugged sentences, his fiery appeals, is on the whole a true picture of the man.

Car'mack, Edward Ward (1858–), an American politician, born in Sumner co., Tenn. He was admitted to the bar and practiced at Columbia, Tenn., was elected to the legislature in 1884, entered journalism and founded the Nashville *Democrat* in 1888, becoming editor in chief when that paper was merged with the Nashville *American.* In 1892 he became editor of the Memphis *Commercial.* He was elected to Congress in 1897 as a Democrat, and in 1901 he entered the United States Senate, where he became a prominent member of the Democratic minority.

Carmagnole, *kahr ma nyole',* a name applied in the early times of the French Republic (1792–1793) to a highly popular song, and the dance by which it was accompanied.

Car'mel, a range of hills in Palestine, extending from the Plain of Esdraelon to the Mediterranean. It has a length of about 16 miles and its highest point is 1850 feet above the sea.

Car'melites, an order of monks of Our Lady of Mount Carmel, claimed by some to have been founded by the prophet Elijah, but as far as known, founded by Count Bertrand in 1156. Bertrand, with ten companions, went to Mount Carmel in Palestine and established the order, but on account of the Mohammedan persecution they were obliged to remove and located in Cyprus. The habit of the order was brown, with a white cloak, from which they were known as the white friars. The Carmelites are characterized by their self-denial in eating and drinking, and by the simple life which they lead. They were first confined to monasteries, but in the thirteenth century their order became mendicant, and in the sixteenth century one branch of the order was known as the Barefooted Carmelites.

Carmine, *kahr'mine,* the fine red coloring matter, or principle, of cochineal, from which it is prepared in several ways. It is used to some extent in dyeing, in water-color painting and in coloring artificial flowers, confectionery and other things.

Carnation, *kahr na'shun,* the name given to many cultivated varieties of the clove pink. Carnations are among the most popular of cultivated flowers, because of their beauty, their fragrance, their long life after they have been picked, and because they blossom at all seasons of the year if properly cared for. Under cultivation, in place of the original lilac of the wild pink of southern Europe, the carnation has assumed a wide variety of forms and tints.

CARNATION

Carnegie, *kahr neg'y,* Pa., Alleghany co., a borough on Chartier's Creek, 6 mi. s. w. of Pittsburg. It is on the Pittsburg, Cincinnati, Chicago & Saint Louis and the Pittsburg, Chartiers & Youghiogheny railroads. There

ANDREW CARNEGIE

Khartum, are extensive iron, steel and lead works, and coal is largely mined here. Population in 1910, 10,009.

Carnegie, ANDREW (1837–), an American capitalist and philanthropist, born at Dunfermline, Scotland, whence his father, a handloom weaver, emigrated to America in 1848. The family settled in Pittsburg, where Andrew obtained employment first as a telegraph messenger. He became an operator and was finally promoted to become division superintendent on the Pennsylvania railroad. A fortunate acquaintance with the sleeping-car patentee laid the foundation of his success; then came lucky ventures in oil and the starting of a rolling mill, from which has grown the largest system of iron and steel industries in the world. He was the head of the Carnegie Steel Company, the largest single interest in the formation of the United States Steel Corporation in 1901. In that year he retired from business, devoting himself to travel, literature and philanthropy. Among his chief benefactions are the following: $10,000,000 to Carnegie Institute, a technical institution, Pittsburg; $10,000,000 to found the Carnegie Institution, Washington (See CARNEGIE INSTITUTION); $10,000,000 to Scotch universities; $10,000,000 for a pension fund for American college professors; $5,000,000 for a benefit fund for employes of the Carnegie Steel Company, and more than $40,000,000 for 1500 public library buildings in England, Scotland and America.

Carnegie Institution, an institution founded by Andrew Carnegie for the purpose of promoting higher education and original research. The plan is similar to that of the Smithsonian Institution. No degrees are to be granted, and no special grade of scholarship is to be required for admission to the privileges which the Institution offers. According to the terms of the gift the scientific departments of the government are to place their records and museums at the disposal of the students. The institution was incorporated Jan. 4, 1902, and the board of trustees was elected on Jan. 9. By terms of the grant the president of the United States, the president of the United States Senate, the speaker of the House of Representatives, the secretary of the Smithsonian Institution and the president of the National Academy of Sciences are *ex-officio* members of the board of trustees. The grant specifies the following purposes of the institution: 1. To promote original research. 2. To discover exceptional men in the various departments of study. 3. To increase facilities for higher education. 4. To increase the efficiency of universities and other institutions. 5. To insure prompt publication and distribution of the results of scientific investigation. The Institution is organized into departments and committees for carrying on these lines of work.

Carne'lian or **Cornelian,** a red variety of chalcedony, usually of a clear, rich color. It takes an excellent polish and is used in common jewelry for seals, bracelets, necklaces and other ornamental articles. See CHALCEDONY.

Car'nival, the feast or season of rejoicing before Lent, observed in Catholic countries with much revelry and merriment. The word is often applied to any season of rejoicing.

Carniv'ora, a large order of mammals, well represented by the cat and dog. The Carnivora vary in size and in habits of life, though most of them subsist wholly or partially on flesh. The teeth are large, strong, with sharp cutting edges, so they can cut and tear the flesh-food with ease. The Carnivora walk flat upon their feet, and the cats, in walking, retract the claws which arm their toes. The carnivora are natives of every country, with the possible exception of Australia, but the distribution of many species is peculiar and interesting. Bears are not found in Madagascar, and only one species is known in the tropical regions. The only Carnivora in Madagascar are practically peculiar to the island. The raccoon family is peculiar to the New World. while nearly all of the badger, sable and otter groups are confined to the Old World. No hyenas are found in the New World. In one group are the seals, sea lions and walruses, all of which are aquatic, and most of which are confined to the ocean; all these are more or less fish-like in form, and in general their limbs are enclosed within the skin. See CAT; COYOTE; DOG; ICHNEUMON; LEOPARD; LION; SKUNK; WOLF, and articles relating to numerous other species.

Carnivorous Plants, a group of plants of many different species, that use for food small animals, especially insects. Most of these plants live in moist places, where there is an absence of nitrogen, which is supplied by the insects. The sundews or droseras, the most common, have small, thick leaves supplied with sticky, sensitive hairs which hold and press around the insect when it alights. In the Venus's flytrap the leaves are modified into hinged traps provided with bristles. The pitcher plants also belong to this group. See DROSERA; VENUS'S FLYTRAP; PITCHER PLANTS.

Carnot, *kahr no'*, Lazare Nicolas Marguerite (1753–1823), a French statesman, mathematician and strategist. When the French Revolution broke out, he soon became prominent, was a member of the assembly and of the National Convention and voted for the death of the king. As a member of the Committee of Public Safety he was given charge of military affairs, and much of the French success in the early years of the revolution was due to his remarkable executive talents. After the Reign of Terror he was impeached, although he had not been actively concerned in the excesses of the Terror, and in 1797, because he would not agree to the designs of Barras, he was forced to leave France. When Napoleon came to power, he recognized Carnot's genius and made him minister of war. So able was his work in this department that Napoleon gave him the name of "the organizer of victory." Although during the years of Napoleon's greatest power Carnot opposed him in many of his designs, he returned to Napoleon when his misfortunes began, and was of great help to him during the Hundred Days, after the return from Elba.

Carnot, Marie Francois Sadi (1837–1894), a French statesman, president of the French Republic from 1887 to 1894. He was educated as an engineer and advanced rapidly in his profession, until he was appointed prefect of the lower Seine, during the siege of Paris, in 1871. After the fall of the city he was made a member of the National Assembly, and in 1886 he took office in the Brisson cabinet. On the resignation of Grévy in 1887, Carnot was elected president of France. During a celebration given in his honor at Lyons he was killed by an assassin.

Carob, *kar'ob,* a tree found in the vicinity of the Mediterranean. Its wood is valuable, and it bears a pod that contains a sweet, mealy pulp which is a cheap and healthful food for the poorer classes. The tree is called there the locust tree, but it is much different from the locust of the United States.

Car'oline Ame'lia Eliz'abeth, (1768–1821), wife of George IV of England, to whom she was married in 1795. When her husband came to the throne in 1820, he offered her a large income on condition that she would leave England and never return. She refused, and in June of the same year she entered London amid public demonstrations of welcome. The government now instituted proceedings against her for adultery, but the public feeling and the splendid service of her friends obliged the ministry to give up the divorce bill, after it had passed the Lords. Though banished from the court, the queen lived in a manner suitable to her rank.

Caroline Islands or **New Philippines,** a large archipelago in the North Pacific Ocean, between the Philippines and the Marshall Isles, first discovered by the Spaniards in 1543, if not by the Portuguese in 1525. The chief islands are Yap and Ponapi. The most important vegetable productions are palms, breadfruit trees and bananas. Germany purchased these islands from Spain in June, 1899. Population in 1900, 39,000.

Carolingians, *kar o lin'je anz,* the second dynasty of the French or Frankish kings, which supplanted the Merovingians, deriving their name from Charles Martel. Charles Martel was mayor of the palace and virtual ruler under the weak Merovingian kings, and his son, Pippin the Short, after serving for a time as mayor of the palace, became king in 751. Pippin was succeeded by Charlemagne and his brother Carloman. Charlemagne became sole king in 771 and was succeeded in the Empire of the West by his son Louis the Pious. He divided his empire among his sons, and at his death (840) his son Charles the Bald became king of the part of his territory which corresponds to modern France. He died in 877, and was succeeded by a number of feeble princes. The dynasty came to an end with Louis V, who died in 987.

Carot'id Arteries, the two great arteries which convey the blood from the aorta to the head and brain. The *common carotids,* one on each side of the neck, divide each into an *external* branch, which passes up to the angle of the lower jaw, where it sends branches to the neck, face and outer parts of the neck, and an *internal* branch, which passes deeply into the neck, then, through an opening in the skull behind the ear, enters the brain and supplies it and the eye with blood. A wound in the carotids, unless it be a puncture, results in almost immediate death.

Carp, a family of fresh-water fishes native to southwestern Asia, but now acclimated in all parts of the world. Carp is a favorite food fish

CARP

of Europe, but because of the coarseness of its flesh it is not so well liked in the United States. It thrives and multiplies rapidly in ponds and sluggish streams, and the United States Fish Commission has stocked many such bodies of water with it. The *leather* carps have no scales. Other species are brilliantly colored, while still others are dull. See GOLDFISH.

Carpa'thian Mountains, a range of mountains in southern Europe, chiefly in Austria, forming a great semicircular belt nearly 800 miles in length and partially inclosing the Plain of Hungary. The system includes a number of ranges, the Tatra range in the northwest having the greatest altitude, the highest peak being 8737 feet. The lowest ranges are in the eastern portion and have an altitude of 5000 to 7000 feet. The entire system is rich in minerals, including gold, silver, quicksilver, copper and iron. There are many small but very deep lakes in these mountains.

Car'penta'ria, GULF OF, a large gulf, situated on the north coast of Australia, discovered and explored by Carpenter, for whom it was named. It contains numerous islands, and the shores are low.

Car'penter, MATTHEW HALE (1824–1881), an American jurist and statesman, born in Vermont. He spent two years at West Point, was admitted to the bar in 1847 and settled at Beloit, Wis., whence he removed to Milwaukee in 1856. He was considered the greatest constitutional lawyer of his time, and figured in many important cases, notably as counsel for Samuel J. Tilden before the Electoral Commission. From 1869 to 1875, he was United States senator from Wisconsin. In 1879 he was again elected to the Senate, and died in office.

Carpenter, WILLIAM BENJAMIN (1813–1885), an English physiologist and author of important scientific works, among which are his *Principles of Human Physiology, Principles of Mental Physiology, Physiology of Temperance, Mesmerism and Spiritualism* and many scientific papers on zoölogy and allied subjects.

Carpenter-bee, a common name of a solitary bee which burrows into wood for a short distance and then excavates a tunnel for a foot or more lengthwise of the grain. Beginning at the bottom, the bee lays her eggs each in a separate cell, one above another, and all are filled with a plentiful supply of food for the larvae.

Car'pet, a floor covering made of wool, cotton, hemp, or other material. Woven carpets were first used in Oriental countries and were woven in one piece, but now they are made in narrow strips, to be sewed together. They were introduced from the East into Europe. The first carpet factory in Europe was established in Paris in 1607. The chief carpets now in use are the following: *Brussels* carpets come from Brussels, Belgium, and are the most common in the United States and Europe. The back is of linen, and the face of raised worsted loops. It is woven in simple patterns of not more than five colors. *Wilton* carpets, made in Wilton, England, are similar to Brussels in manufacture, except that the loops are cut open and sheared smooth so as to make a velvet-like surface. The *moquette* carpet, made in the United States, looks like the Wilton, but is made by fastening little tufts of woolen thread to a canvas back. The *ingrain* is an all-wool carpet, woven with two or three webs of different colors. It is smooth-finished on both sides and is usually reversible. The Persian, Turkish and Indian carpets are all woven by hand and are very valuable.

Car'petbag'gers, the name first given to northern politicians who took up their residence in the Southern states, in order to become representatives of those states in Congress. The name is now especially applied to those Northern adventurers who settled in the South after the Civil War, and who from 1865 until 1876 attempted to control the Southern states by becoming leaders of the colored voters. During this period the better class of whites was largely excluded from voting by the reconstruction measures of Congress. The state governments were administered by coalitions of unscrupulous whites and ignorant negroes, which levied enormous taxes, squandered the money in reckless extravagance and speculation and burdened the states with vast debts. These governments were known as carpetbag governments. See RECONSTRUCTION.

CARPENTER-BEE

Carpet Bee′tle, a small beetle about one-eighth of an inch long, marked with black, white and red. The larva is a short, hairy grub that feeds on carpets and woolen clothing. It is a very destructive animal, and its extermination is often very difficult. Pyrethrum powder and naphtha balls are helpful. It is sometimes called the *buffalo moth.*

Car′pet Sweep′er, a device for sweeping carpets. The principal parts of a carpet sweeper are the bail, case, brush and wheels. The *bail* is a metal attachment which circles half way around the sweeper and to which the handle is attached. It is of malleable iron and comes to the sweeper factory warped and crooked. It is placed in a press, which, with a single blow, straightens it out completely. The bail is then polished on emery wheels or belts and is passed to a room where it is boiled in lye and copper and nickel-plated or Japanned, before receiving the final polish on cloth wheels, preparatory to being sent to the assembling rooms. The *wooden case* is usually made of oak. It is run through dry-kilns and allowed to season thoroughly before it is cut up into the proper sizes. The *brush* is a wooden roller thickly studded with bristles. The *rollers* are turned in machines which work automatically, and are given a coat of black filler before reaching the factory. The rollers are first placed in a machine which bores the holes for the bristles, which are also put in by machinery. They are arranged on a long tray and are fed into the machine from the back. A little prong jerks out just enough of the bristles for a bunch and passes it to a pair of metal fingers, which encircle the bunch around the middle with a staple of wire, and then pass it to another pair of fingers, which press the bunch of hair into the hole in the roller and spread the staple until it penetrates the wood and anchors the bristles far stronger than could be done with glue. The brush is put through a machine where it is properly trimmed, and then it goes to the assembling room. The wooden wheels are turned out at the rate of 100 a minute and are carefully finished and painted. The metal wheels are sent to the rubbering room, where rubber bands are put on. The tin for the bottom pans is cut and put in proper shape by automatic machinery. The wire for the springs of the sweeper comes in heavy coils and is also cut into the required length by automatic machinery. Every part of the sweeper is constantly moving toward the assembling room. Each part is kept separate and has an apartment for itself. In the assembling room the parts are all put together and the machine is thoroughly tested.

Carracci or **Caracci,** *kah rah′che,* Ludovico, Agostino and Annibale, Italian painters. Ludovico (1555–1619) was born in Bologna, but went to Venice and subsequently to Florence and Parma. His chief works are his frescoes, *The Assumption of the Blessed Virgin* and *Birth of Saint John the Baptist.* Ludovico, with the assistance of his two cousins, Agostino (1558–1601) and Annibale (1560–1609), founded the Eclectic school of painting at Bologna about 1585. This school, whose aim was to unite all the excellences of the best Italian schools, soon became popular over all Italy. The best specimens of Agostino's paintings are *Infant Hercules Strangling the Serpents,* in the Louvre, and *Saint Jerome Receiving the Sacrament before Death,* at Bologna. The chief work of Annibale is a series of frescoes in the Farnese Palace, *Resurrection, The Dead Christ Supported by the Madonna* and *Three Marys.*

Carrageen, *kar′ra geen.* See Irish Moss.

Carrara, *kah rah′rah,* a city of northern Italy, 59 mi. s. w. of Modena. It is surrounded by hills containing fine white statuary marble. Although the Carrara quarries have been worked for 2000 years, having furnished the material for the Pantheon at Rome, the supply is still practically inexhaustible. They employ 10,000 men. Population in 1901, 21,105.

Carriage, *kar′rij,* a wheeled vehicle, especially designed for carrying passengers. The important parts of a carriage are the body, seat, top, hood, dashboard, apron, step, springs, running gear, perch, forward gear, clip, fifth wheel, tongue, shafts, singletree, doubletree, axle and wheel. The essential parts of wheel are the hub, spoke, felloe and tire. The body of the carriage is usually made of hard wood. It is put together with mortises and tenons, held by screws and glue and strengthened with iron braces. The top in some carriages, as in the coach, is supported on wooden uprights; in others it is made of an iron frame, which can be folded or opened into a braced position. This frame is covered with leather or canvas. The gear is made of wood and iron. The hubs, felloes, spokes and shafts and the frame to which the axles are attached are of wood. The axles are of steel, and the hubs are fitted with steel boxes. In the most modern pattern of carriages the wheels revolve upon ball bearings. The fifth wheel is made of steel or iron and is the device upon which the forward axle operates. Modern carriages are manufactured in a great variety of styles, each of which has its own particular name, but all may be grouped under two classes—two-wheeled and four-wheeled vehicles. See BROUGHAM; BUCKBOARD; BUGGY; CAB; CALASH; CART; CHAISE; CHARIOT; COUPE; HACK; HANSOM; WAGON.

Carrier, *kar're ur*, COMMON, an individual or corporation which transports goods and passengers for hire. Two rules of law govern the regulation of carriers: (1) they must carry any who apply to them, without discrimination; (2) they are responsible, in the case of transportation of freight, for the loss or injury of the goods entrusted to them, even without negligence on their part. This responsibility extends to all cases except those arising (a) through "act of God," that is, accidents in which there is no human agency; (b) through act of a public enemy, that is, a government at war, or pirates; (c) through the act or default of the shipper; (d) through acts of public authorities; (e) from the nature of the goods transported; (f) from the ordinary wear and loss, such as perishable goods. The liability of the carrier begins when the goods have been placed in the hands of its agents, and its liability ends when they have been transported to the place agreed upon. This may be, in the case of a railroad, in its freight house at the point of destination; in the case of express companies, at the business or residence address of the consignee. The relation of common carriers to the public has been changed in various ways by statutes of the states and may be changed to a limited extent by special contracts between shippers and the carrier.

In relation to *passengers*, the carrier is bound to carry those whom it accepts, without negligence. In the case of accident it rests with the carrier to show that the accident arose from no fault of its own or on the part of its servants or agents. Hence, injured passengers or, in case of death, their nearest relatives, have a claim for compensation, provided they did not contribute to the injury by negligence. These same rules apply in general to carriers by water, together with certain special regulations applicable to these carriers alone. In case of danger from tempest or from enemies, ship passengers may be called upon by the captain or commander to lend their assistance for the general safety.

Carrier Pigeon, *pij'un*, or **Homing Pigeon,** a variety of the common domestic pigeon, which is sometimes used for the purpose of carrying messages. Carrier pigeons are large birds with long wings, a large mass of naked skin at the base of the beak and a circle of naked skin around the eyes. They have been used from the earliest times and are now kept in large numbers in various parts of the world, but more as a pleasure and curiosity than for any practical service. Their speed is marvelous, and the distance through which they can fly without rest seems almost incredible. An American homing pigeon is known to have made a journey of 1040 miles without stopping. These birds cannot be induced to fly away from home, and are teachable merely because of the strong instinct which tells them where home is and leads them to fly straight to it.

Car'roll, CHARLES, of Carrollton (1737–1832), an American statesman, born at Annapolis, Md. At the outbreak of the Revolution he was the wealthiest man in the colonies and used his influence and means freely for the aid of liberty. In 1776 he was elected to the Continental Congress from Maryland and signed the Declaration of Independence. He was again a delegate to Congress in 1777 and served on the committee which visited Valley Forge to investigate complaints about General Washington. In 1788 he was elected the first senator from Maryland under the Constitution of the United States, serving until 1791. He was the last surviving signer of the Declaration of Independence.

Carroll, JOHN (1735–1815), an American Catholic archbishop, a cousin of Charles Carroll of Carrollton. He was descended from the Carrolls who emigrated to Maryland about the year 1689. In 1789 he was appointed first bishop in the United States, with his see in Baltimore. He was an ardent Federalist and one of the most powerful factors of his church in this country. For many years he was the only bishop in the United States, and in 1808 he was made archbishop, with power over four sees. Congress invited him to deliver a panegyric on Washington, on Feb. 22, 1800. His writings are chiefly controversial.

Carroll, LEWIS. See DODGSON, CHARLES.

Carrot, *kar'rut*, a plant of the parsley family, which is cultivated for its root. In the cultivated variety it is slender, tapering and of a yellow or reddish color, but in the wild species the root is nearly white. In Germany the carrot, cut into small pieces and thoroughly dried, is used as a substitute for coffee, and in the United

States it has been extensively used to adulterate coffee. As an article of food the carrot is boiled and eaten as a vegetable, or is served as an ingredient of soup. In Europe it is extensively used as a food, but in the United States it is cultivated more widely as fodder for cattle. In its wild state it becomes a troublesome weed.

CARROT

Car'son, Christopher (1809–1868), an American frontiersman, better known as "Kit Carson." He was born in Madison co., Kentucky, but was early taken to Missouri, where for a time he was apprenticed to a saddler. In 1826 he began the adventurous life which made his name known everywhere in the West as the symbol of the highest ingenuity and daring. In that year he accompanied a party of hunters to New Mexico, later went several times to the Pacific coast and acted as hunter for western army garrisons. He was with Fremont in several expeditions across the Rockies and also occasionally assisted western ranchers in driving cattle and sheep for long distances through the wild western country. At one time Carson alone took a drove of more than fifty mules and horses for a distance of five hundred miles through an almost uninhabited region. Appointed United States agent to the Utah and Apache indians in 1854, he performed notable service for the government, through his friendship with influential chiefs, and during the Civil War, as a scout in the southwest, he acted with great energy and skill in behalf of the Union, being brevetted brigadier general at the close of the war. Many of his thrilling adventures as scout, guide, hunter, trapper and indian fighter were almost incredible. In cunning, quickness, resourcefulness and daring, he rivaled, if he did not excel, the most expert indians.

Carson City, Nev., the capital of the state and the county-seat of Ormsby co., 31 mi. s. of Reno, on the Virginia & Truckee railroad. The city has a picturesque location in an agricultural region, near the base of the Sierra Nevada mountains and about 12 miles from Lake Tahoe. The principal industries are mining, lumbering and agriculture, and there are also railroad and machine shops. A government mint and the state capitol are in the city, while the state prison is two miles to the southeast, and a United States government indian school is three miles to the south. Carson City was founded in 1858, became the capital of the state in 1861, but was not chartered as a city till 1875. Population in 1900, 2100.

Cart, a carriage with two wheels, with or without springs, fitted to be drawn by one horse. Light carts with springs are used for driving, and heavy carts for hauling sand, clay, rocks and other heavy freight.

Cartagena or **Carthagena,** *kahr'ta je'na,* a seaport of Colombia, capital of the State of Bolivar, situated on the Caribbean Sea. It has a fine, strongly fortified harbor. The cathedral, two other churches, the government building, a theater, a college and a seminary are the most important buildings. The leading manufactures are chocolate and candles. The exports are cattle, hides, precious stones, coffee, cotton, ivory-nuts and rubber. The trade, which had partly gone to Sabanilla and Santa Marta, is being recovered since the reopening of the canal to the river Magdalena. Population, about 25,000.

Cartagena or **Carthagena,** a seaport of Spain, situated 31 mi. s. e of Murcia. Its harbor, which is one of the largest and safest in the Mediterranean, is sheltered by lofty hills. It is a naval and military station, the arsenal containing barracks, docks, hospitals and machine shops. Lead smelting is largely carried on, and there are in the neighborhood rich mines of excellent iron. Esparto grass, lead, iron ore, oranges and other fruits are exported. Among the buildings worthy of note are the Hospital Militar, the Presidio and the Gothic cathedral of the thirteenth century. Cartagena was founded by the Carthaginians under Hasdrubal about 243 b. c., and was called New Carthage. It was taken by Scipio Africanus (210 b. c.) and was long an important Roman town. It was ruined by the Goths and revived in the time of Philip II. Population in 1901, 103,373.

Carte Blanche, *kahrt blahNsh,* (white paper), a blank paper authoritatively signed and entrusted to a person to fill up as he pleases. Thus, in 1649 Charles II tried to save his father's life by sending from the Hague to the Parliament a signed *carte blanche,* to be filled up with any terms which they would accept as the price of his safety. In 1832 Earl Grey was said to have been armed with a *carte blanche* for the creation of new peers. The term is now used figuratively to mean a gift of unlimited powers.

Car'teret, George, Sir (?–1680), an English loyalist. When the civil war broke out in

England between Charles I and Parliament, Carteret took the side of the king and served in the navy; after the Parliament had triumphed, he joined the French navy. Charles II, on his restoration, rewarded him and gave him, in company with Lord Berkeley, the territory which was given the name of New Jersey, in America. The annual rental of this territory was set at one peppercorn on demand. When, some ten years later, it became necessary to divide the territory, Carteret received East Jersey for his share.

Cartesian, *kahr te'zhan,* **Diver,** a toy consisting of a small hollow glass figure, having a little opening some distance below the top and so light that it will float. The figure is placed in a narrow bottle or other cylindrical vessel, filled with water. The mouthpiece of the bottle is closed with a piece of bladder or rubber so as to shut out the air. On pressing upon this membrane the air inside the figure is compressed, water enters and the figure sinks to the bottom of the vessel. When the pressure is removed, the expansive force of air in the figure drives the water out and the figure rises to the top. A similar toy can be made by taking a small vial, partially filling it with water and placing it upside down in a larger bottle. By pressing upon the cover of the bottle, the vial rises and falls, the same as the toy figure would do.

Car'thage, an ancient and celebrated city on the northern coast of Africa. According to an old legend, Carthage was founded by Dido, a Phoenician queen, in 878 B. C., but it is more probable that it was founded about 850 B. C. by Tyrian merchants, as a trading post. It was situated about 20 miles south of Utica and near the site of modern Tunis. The city was built on a peninsula about three miles wide, across which was a triple wall of towers. All the sides were defended by walls, and a double harbor served for merchants' ships and for the navy. At its height, Carthage had a population probably greater than Rome, amounting, it is said, to 700,000, and it also had the largest navy in the world. The Carthaginians gradually acquired dominion over the other Phoenician colonies of northern Africa and over the neighboring tribes, and the city soon became one of the greatest of commercial centers. Early in the sixth century B. C. the Carthaginians were allies of the Phoenicians, who in Sicily were crowded by the Greeks. After checking the Greeks, they reduced the coast of Sardinia, founded colonies there and gained control around the western Mediterranean and in Spain. Their first wars of importance were with the Greeks in the fifth century B. C., over the control of Sicily. The results were successes on each side and the final abandonment of the island by the Greeks. Rome was in the meantime conquering southern Italy, and thus the two nations were brought together. The wars which followed are called the Punic Wars (See PUNIC WARS). In 149, Rome, after a siege of two years of desperate fighting, captured the city and destroyed it by fire. The emperor Augustus rebuilt the city in 29 B. C., and the New Carthage became one of the finest cities of the Roman Empire. To-day ther eare no remains of the ancient city but a portion of its wall. The religion of the Carthaginians consisted of the worship of the stars and fire, and Moloch was their chief deity, to whom human sacrifices were offered.

Carthage, Mo., the county-seat of Jasper co., 150 mi. s. of Kansas City, on the Spring River and on the Missouri Pacific, the Saint Louis & San Francisco and other railroads. The city is in an extensive lead region, has zinc mines, stone and lime works, flour mills, machine shops and other manufactories. It is an important trade center, and is also noted for its excellent public schools. The city itself was destroyed during the Civil War, but it was soon rebuilt. The place was first settled in 1833 and was incorporated in 1873. Population in 1910, 9483.

Car'thage'na. See CARTAGENA.

Carthusians, *kahr thu'zhanz,* an order of monks founded in the eleventh century by Saint Bruno of Cologne, who with six companions went to the desert of Chartreuse in the Alps, far above sea level, and built a small convent, donned coarse garments and lived as hermits. The members of the order fast frequently and eat no flesh or fish except what is given them. They usually have one meal a day, and this consists of bran bread. The dress is white, except a long black cloak and hood worn outside the monastery. The Carthusians were, from the beginning, well educated and given to hospitality and charity. At one time they had the finest convents in the world, of which La Grande Chartreuse, in France, and the Certosa di Pavia, south of Milan, are among the most celebrated. They originated the famous liquor *chartreuse,* from the sale of which they derive considerable revenue. It was from the name of this order that the term *Charter House* originated.

Cartier, *kahr tya',* SIR GEORGE ETIENNE (1814–1873), a Canadian statesman. He was admitted to the bar in 1835, took part in the rebellion of 1837 and had to leave Canada; but he was later pardoned, and in 1848 he entered the Canadian Parliament, becoming provincial secretary. In 1856 he became attorney general for Lower Canada, in which post he was active in behalf of legal reforms. In 1857 he was a member of the Macdonald ministry, and in 1858 he himself became premier. He was active in bringing about the confederation of Canada in 1867, and held a post in the first Dominion cabinet.

Cartier, Jacques (1494?–1557?), a French navigator, born at Saint Malo. He commanded an expedition to North America in 1534, entered the Straits of Belle Isle and took possession of the mainland of Canada in the name of Francis I. He subsequently went to found a settlement in Canada and built a fort near the site of Quebec, but it was soon abandoned.

Cartilage, *kahr'ti laj,* or **Gristle,** *gris''l,* a pearly white, firm and very elastic tissue, occurring in vertebrate animals. When cut, the surface contains no visible cells, cavities or pores. It enters into the composition of those parts which must be firm yet easily bent. *Temporary cartilages* are substitutes for bone in the earlier periods of life, and they finally become bone. The extremities of the long bones at birth are cartilage. A good illustration of a temporary cartilage is found in the breast-bone of a chicken. The *permanent cartilages* are attached to the extremities of bones in the formation of a joint, are found in the external ear, aid in forming the nose and are the foundation of the eyelids, the trachea and the larynx.

Cartoon', in painting, a drawing made on heavy paper or cardboard, and used as a model for a large picture in fresco, tapestry or oil color. The cartoon is made exactly the size of the picture intended, and the design is transferred to the surface to be ornamented by tracing or other processes. The most famous cartoons are those painted by Raphael for the Vatican tapestries. Originally there were twenty-five, but they were neglected and changed hands so many times that now only seven remain, and these are at the South Kensington Museum, London. Some of the subjects represented are *Paul Preaching at Athens, The Miraculous Draught of Fishes, The Death of Ananias* and *The Sacrifice at Lystra.* In modern times the term is also applied to a pictorial sketch intended to ridicule some notable character, a party or some habit or belief. See Caricature.

Cartouche, *kahr toosh',* a term to designate a tablet used for ornament or for receiving inscriptions, generally in the form of a scroll unrolled. In Egyptian architecture, cartouches were the oval or elliptical figures carved on monuments and temples to receive hieroglyphic inscriptions of different kinds. In heraldry the term denotes a kind of oval shield, much used by the popes and princes in Italy, and others, both clergy and laity.

Cartridge, *kahr'trij,* a case of paper, parchment, flannel or metal suited to the bore of firearms, and holding the exact charge, including, in the case of small arms, both powder and bullet. The cartridges used for breech-loading rifles contain the powder in a case of solid brass and have the percussion cap by which they are ignited, fixed in the base. Such cases can be refilled and used a number of times. Cartridges for large guns are usually made of flannel and contain only the powder. A *blank cartridge* is a cartridge without ball or shot. Cartridges for blasting are filled with dynamite or other explosive.

Cart'wright, Edmund (1743–1823), the inventor of the power loom. He was educated at Oxford and took orders in the Church. At the age of forty his attention was first attracted to mechanics, and in 1785 he brought his first power loom into action. Although much opposed both by manufacturers and workmen, this loom made its way and in a developed and improved form is now in universal use. Cartwright spent much of his means in similar inventions and fell into straitened circumstances, from which a parliamentry grant of $50,000 relieved him. See Loom; Weaving.

Cartwright, Peter (1785–1872), an American clergyman and lecturer, born in Virginia. He was ordained to the Methodist ministry in Kentucky in 1806 and became presiding elder of his district, but removed to Illinois in 1823. There he became conspicuous for his eloquence and earnestness as a preacher, as well as for his eccentricity of manner. It is said that in thirty years after his removal to Illinois he converted twelve thousand persons. In 1846 he was candidate for congressman, but was defeated by Abraham Lincoln.

Cartwright, Sir Richard John (1835–), a Canadian statesman, born in Ontario. He was educated at Trinity College, Dublin, engaged first in the law, then in banking, and entered the Dominion Parliament as a Conservative in 1863. In 1870 he identified himself with the

Liberal party and became minister of finance under Premier Mackenzie, and minister of trade and commerce under Laurier in 1896. He was a member of the Anglo-American joint high commission in 1898.

Car′ver, John (1575–1621), the first governor of Plymouth colony in the New World. He was born in England and went to Leyden, then a refuge for the Puritans. He was an elder in the church and in 1620 sailed with the Pilgrims in the *Mayflower*, being unanimously elected governor before the landing. Carver was a prudent and firm ruler, but he died at Plymouth four months after his arrival.

Carv′ing, as a branch of sculpture, the process of cutting a hard body, usually ivory or wood, into some particular shape by means of a sharp instrument. This art was common in ancient times among the Babylonians, who carved ivory and practiced gem engraving to a considerable extent. In early ages statues of the gods were made of wood, painted, and clothed with colored draperies. Carving in both ivory and wood became general for the decoration of the early Christian churches. During the last part of the Middle Ages, the art of wood carving was brought to a high degree of perfection in Germany, where it was practiced especially in the decoration of shrines and altars. The carving was very elaborate, sometimes representing whole scenes from well-known legends of the saints. Many Lutheran churches in Nuremberg retain these ornaments exactly as they stood in early times. In most countries of Europe the art has been largely displaced in recent times by molded work of various kinds and by metal casting.

Ca′ry, Alice (1820–1871), an American novelist and poet. Her opportunities for getting an education were limited, but when she was eighteen she began writing verses and for the next ten years published many pieces, both in prose and verse, in newspapers and magazines. In 1850, with her sister Phoebe, she removed to New York, where, under the patronage of Horace Greeley, the sisters continued their literary work. While their verses are not always perfectly constructed, yet they are sweetly musical and filled with the highest sentiment. *Hagar, a Story of To-day*; *Lyrics and Hymns*; *The Bishop's Son*, and *Snowberries, a Book for Young People*, are among her works of note. The poems of Alice and Phoebe Cary were published together. See Cary, Phoebe.

Cary, Phoebe (1824–1871), an American poet, the sister and life-long companion of Alice Cary. Most of her writings were poems, but she frequently contributed prose to various periodicals. Besides what she published in conjunction with her sister, she wrote *Poems and Parodies* and *Poems of Faith, Hope and Love*. The hymn beginning "One sweetly solemn thought" is the finest of her songs and, with the charming poems which she wrote for children, preserves her reputation. The best biography of the Cary sisters is *A Memorial of Alice and Phoebe Cary*, published by Mary Clemmer Ames. See Cary, Alice.

Caryatides, *kar′i at′i deez*, or **Car′yat′ids,** the name applied in Greek architecture to the figures of women dressed in long robes, standing upright in graceful positions and used as columns to support a roof. The most celebrated of these figures appear on the southwest porch of the Erechtheum, Athens. The corresponding male figures are called *Atlantes*.

Cascade, *kas kade′*, **Range,** a range of mountains in the United Sates, British Columbia and Alaska, near the Pacific coast, to which it is parallel, extending from the Sierra Nevada, in California, northward to Alaska. In the United States, the Columbia and Klamath rivers cut their way through these mountains to the sea, forming deep gorges or canyons noted for the beauty of their scenery. The range contains several active volcanoes. The highest peaks are Mount Shasta, 14,510 feet; Mount Rainier or Tacoma, 14,444 feet; Mount Adams, 12,490 feet, and Mount Hood, 11,225 feet. These mountains are of volcanic origin, and the highest peaks are extinct volcanoes.

Cascade Tun′nel, a tunnel on the Great Northern railroad through the summit of the Cascade Mountains, in Montana. The length is 13,413 feet, or 2.6 miles. This is prolonged by extending the lining 200 feet at each end, to take the place of snow sheds. The width is sixteen feet, and the height is twenty-one feet six inches. The lining is of concrete and varies in thickness from twenty-three inches to three feet six inches. The construction was attended with many difficulties on account of the nature of the ground. A large portion of the excavation was through gravel containing large bowlders, and the pressure from above was tremendous. The ground also contained a great deal of water.

Cas′caril′la, the bitter bark of a small euphorbia tree. It has medicinal properties resembling those of quinine; in fact, the name cascarilla has been commonly given to the Peruvian bark, in the region where it grows.

Cas'co Bay, a bay of Maine, between Cape Elizabeth on the s. w. and Cape Small Point on the n. e. Within the bay are more than 300 small islands, most of which are very fertile; almost all are occupied by summer residences. Portland is situated on the west side of the bay, which forms one of the best harbors on the Atlantic coast.

Casein, *ka'se in*, that substance in milk which is coagulated by the action of acids, and which constitutes the chief part of the nitrogen contained in it. Cheese made from skimmed milk and well pressed is fully half casein. Casein is one of the most important elements of animal food found in milk and leguminous plants. It consists of carbon, hydrogen, nitrogen, oxygen and sulphur.

Case Shot, a charge of ammunition, formed by putting a quantity of small iron balls into a cylindrical tin box, called a *canister*, that just fits the bore of the gun. The shrapnel shell is a modern variety of case shot.

Cashew, *ka shoo'*, a tree common in the West Indies. Its fruit is a small, kidney-shaped, ash-gray nut that contains an acrid juice. The nut is used to flavor Madeira wine, and it is eaten cooked in various ways. The stalk or receptacle is large and fleshy and has an agreeable acid flavor.

Cashmere, *kash meer'*. See KASHMIR.

Cash'mere Goat, a variety of goat, remarkable for its fine, silky fleece, and found in Tibet and India. The colder the region where the goat pastures, the heavier is its fleece. A full-grown goat yields not more than eight ounces of the valuable down which underlies the long hairs. A large shawl of the finest quality requires five pounds, and one of the inferior quality requires from three to four pounds. The flesh of the cashmere goat is suitable for food, and when well cared for the animal gives a rich milk. See GOAT.

Cash Register, a machine for recording the cash received for sales in retail stores. It consists of a metallic box, with keys arranged similarly to those on a typewriter, each key representing an amount purchased. When this amount is beyond the limit of the machine, it can be registered by pressing two or more keys at once. When the key is pressed, it throws a tablet, showing the amount of purchase, into such a position that it can be seen both by the customer and the salesman, and at the same time it opens the cash drawer. It also registers the amount purchased on a long roll of paper, turned forward by a system of wheelwork that is under lock and key. The amount of the day's sales is determined by adding the various amounts registered on this roll. Cash registers are now in very general use in stores and shops where small sales are made. Calculating attachments are now commonly employed in cash registers. See CALCULATING MACHINES.

Casimir-Perier, *ka ze meer'pa rya'*, JEAN PAUL PIERRE (1847–), a French statesman. He was trained for a political career, but during the Franco-Prussian war greatly distinguished himself, receiving the cross of the Legion of Honor. In 1874 he was elected to the Chamber of Deputies, and three years later he entered the cabinet as under-secretary of state. He formed a ministry in 1893, but it was of short duration. On the assassination of Carnot in 1894, he was elected president of the French Republic, but he resigned in less than a year.

Casino, *kas se'no*. See CASSINO.

Cas'pian Sea, a large lake or inland sea between Europe and Asia. It is 730 miles long and 330 miles wide, with an area of 170,000 sq. mi., and is the largest interior body of water on the globe. Russian territory surrounds it on three sides, Persia on the fourth. The Caspian receives several large rivers, including the Volga, Ural and Kura. It abounds in shallows, making navigation difficult. The water is less salt than that of the ocean, is of a bitter taste and of an ocher color. It does not have ebb or flow. The fisheries are valuable. Steam packets are now established on it. The Russians have also a fleet of war ships in the Caspian.

Cass, LEWIS (1782–1866), an American statesman, born in Exeter, N. H. He was admitted to the bar and became prominent in Ohio politics. In 1813, having entered the army, he rose to the rank of brigadier general. From 1814 to 1830 he was governor of Michigan, in 1831 was secretary of war, was several times a candidate for the presidency, served twelve years in the United States Senate and was secretary of state in Buchanan's cabinet. He believed, with Clay and Webster, in the Union, and voted for measures designed to maintain it. These were in reality in the interests of slavery, and won him unmerited reproach.

Cassan'dra, in Greek legend, a daughter of Priam and Hecuba. She was endowed by Apollo with the gift of prophecy, but when she refused to accept his love, he became angry, and because he could not take from her the gift which he had bestowed, he ordained that no one should believe her prophecies. She frequently foretold the fall of Troy and warned her countrymen against the stratagem of the Wooden Horse (See Wooden Horse). No attention, however, was paid to her warnings.

Cassatt′, Alexander Johnson (1839–1906), an American capitalist and railway promoter, born at Pittsburg, Pa., educated at the University of Heidelberg and Rensselaer Polytechnic Institute. After being engaged for a time in railroad surveys, he entered the service of the Philadelphia & Trenton railroad, and in 1867 he became superintendent of motive power and machinery on the Pennsylvania railroad. He became general superintendent in 1870, general manager of the eastern division in 1871, third vice-president in 1874, first vice-president in 1880 and president in 1899.

Cas′sava, a South American shrub, about eight feet in height, with broad, shining, hand-shaped leaves, and beautiful white and rose-colored flowers. A nutritious starch, called by the same name, is obtained from the white, soft root of the plant. It is prepared in the West Indies, tropical America and Africa. The tapioca of commerce is made from cassava.

Cassel or **Kassel,** *kahs′sel,* the capital of the province of Hesse-Nassau, Prussia, on the Fulda River, 91 mi. n. n. e. of Frankfort-on-the-Main. Cassel is one of the most beautiful towns of its size in Germany. There are numerous fine buildings and educational and charitable institutions. The city has manufactures of machinery, mathematical instruments, gold and silver wares, chemicals, knives, gloves, leather and porcelain. Population, 106,000.

Cassia, *kash′ah,* a large genus of plants belonging to the pea family and found in the tropical parts of the world. The cassias consist of trees, shrubs or herbs. The leaves, which are compound, usually bear glands on their stalks. The leaflets of several species constitute the well-known drug called senna, and both leaves and flowers are used as medicines. *Cassia bark* is a common name for the bark of an entirely different plant, belonging to the laurel family. Its flavor resembles that of cinnamon, and as it is cheaper it is often substituted for it. The cassia of the Bible was probably cassia bark.

Cassino or **Casino,** *kas se′no,* a simple game played by two or more persons with a full pack of cards. The cards are dealt one at a time to each of the players and to the center of the table, in succession, until four have been dealt to each. Those on the table are turned face up. The player at the left of the dealer begins by taking from the table any cards that have the same value as one in his hand; or he may take any number of cards, the sum of whose spots equal any card in his; as, an eight will take all other eights, a six and a two, a five and a three, a three and a three and a two or any combination that makes eight. The player can play but one card in his turn, and if he can take none with it, he lays it upon the table, face up. He may, however, *build;* for example, if there is a two on the table and he has a three in his hand, he may lay this three upon the two and call five, providing he has in his hand a five with which to take the pile at his next turn. He may also build a pair upon the table, providing he has a third card of the same denomination with which to take the pair. An opponent may build from his hand on any pile excepting a pair. When the four cards have been played in rotation, four more are dealt to each player, and so on until the pack is exhausted. When all the cards have been played to the table, the one who takes the last "trick" has also the cards that remain. The points that count are Little Cassino (the two of spades), 1; Big Cassino (the ten of diamonds), 2; each ace, 1; the greatest number of cards held by a single player, 3; the greatest number of spades held by a single player, 1. If at any time a player can take all the cards from the table, except in the last hand, it is called a *sweep* and counts 1 to the player. The usual game is 21 points.

Cas′siope′ia, a bright constellation in the northern hemisphere, often called the "Lady in her Chair." It contains fifty-five stars, five of which, arranged in the form of a W, are of third magnitude.

CASSIOPEIA

Cassiquiare or **Cassiquiari,** *kahs′se ke ah′re* a large river of South America, in Venezuela, which branches off from the Orinoco and joins the Rio Negro, a tributary of the Amazon, thus connecting the two river systems. At different seasons of the year the water in this river flows in opposite directions.

Cassit′erite, an ore of tin, from which most of the metal is obtained. It consists of 79 parts of tin and 21 parts of oxygen. Cassiterite is found in large quantities in Cornwall, England; Saxony; the Malay Peninsula, and at Banca, Australia. See TIN.

Cassius Longinus, *kash′us lon ji′nus,* CAIUS, a distinguished Roman, one of the assassins of Julius Caesar. In the civil war that broke out between Pompey and Caesar, he espoused the cause of the former, and, as commander of Pompey's naval forces, rendered him important services. After the Battle of Pharsalia he was apparently reconciled with Caesar, but later he was among the more active of the conspirators who assassinated him, 44 B. C. He then, together with Brutus, raised an army, which was met by Octavianus and Anthony at Philippi. The wing which Cassius commanded was defeated, and, as he imagined that all was lost, he compelled one of his freedmen to kill him (42 B. C.).

Cas′sowa′ry, a large bird belonging to the same family as the ostrich and emu. It is a native of New Guinea and stands about five feet high. Its peculiar feathers hang down its sides, resembling long hair. Its head and neck are bare and bluish in color, and its head is crowned by a bony crest of brilliant blue, scarlet and purple. The wings of the cassowary are so short that it is unable to fly, but its legs are powerful and it can run with great speed. To the natives it is a valuable bird, as it can be domesticated.

CASSOWARY

Cast, in art, a representation or impression of a statue, bust or other model, by means of wax, plaster of Paris or some other substance. The model is covered with the plaster, so applied as to form a kind of shell over the surface, and is divided into sections which can be removed, one at a time. The different sections are put together when dry and form the mold; the mold is filled with liquid plaster, which soon hardens and is a reproduction of the model.

Casta′lia, a celebrated fountain in Greece, sacred to Apollo and the Muses, and fabled to have the power of inspiring those who drank its waters. It issues from a fissure between two peaked cliffs adjoining Mount Parnassus.

Cas′tanets, a musical instrument composed of two small concave shells of ivory or hard wood, shaped like spoons, placed together, fastened to the thumb and beat with the middle finger. This instrument is used by the Spaniards and Moors as an accompaniment to their dances and guitars.

Caste, meaning breed or race, a term applied to a class or section of a people who are marked off from others by certain restrictions, and whose burdens or privileges are hereditary. It was originally applied to the classes in India whose occupations, customs, privileges and duties are hereditary. It is probable that caste was originally grounded on a difference of descent and mode of living, and that the separate castes were originally separate races. It now prevails principally in India, but it is known to exist or to have existed in many other regions.

Castelar, *kahs ta lahr′,* EMILIO (1832–1899), a Spanish statesman. In 1856 he was made professor of history in the University of Madrid, but, becoming involved in the republican disturbances of 1866, he had to take refuge in Switzerland. He went back to Spain in 1868 and was returned to the Cortes in the following year. In 1873 he was elected president of the Cortes, under the newly-formed republic, but resigned in January, 1874. After the pronunciamento in favor of Alfonso XII, in December, 1874, Castelar retired from Spain, but in a year or two he returned and was for many years a member of the Cortes. Despite his early republican convictions, he was gradually forced to the opinion that Spain could be successfully governed only by a king. He published many novels, essays, histories and political works.

Castellamare, *kas tel′a mah′ray,* a city of Italy, 17 mi. s. e. of Naples. The beautiful location, healthful climate and mineral springs of this place make it a popular pleasure and health resort. It has a royal palace, a cathedral, convents, a military hospital and a royal dock yard. The castle from which the city takes its name was built by Emperor Frederick II in the thirteenth century. The chief manufactures of the town are cotton, linen, silk and leather. The fisheries are of considerable importance. This city is near the ancient Stabiae, where Pliny the Elder met his death during the eruption of Vesuvius, in 79 A. D. Population, 32,600.

Castiglione, *kah′ste lyo′na,* BALDASSARE (1478–1529), an Italian writer and statesman. Among his works, the *Book of the Courtier,* a series of imaginary dialogues covering all points of court life and etiquette, is the most celebrated.

Castile, *kas teel′,* an ancient kingdom of Spain which formerly occupied a large part of what is now the Spanish peninsula, extending southward from the Bay of Biscay. Castile is interesting because of its historical associations. It was the ancient kingdom which formed the nucleus of the Spanish monarchy. In the latter part of the fifteenth century Isabella, heir to the throne of Castile, married Ferdinand, king of Aragon, and the two kingdoms were at first nominally and then formally united. Castile was one of the strongest states in the conflict with the Moors, and it was largely due to its military strength that these people were expelled from Europe.

Cast′ing, one of the arts of a fisherman. See ANGLING.

Cast I′ron. See IRON, subhead *Cast Iron.*

Castle, *kas″l,* an edifice serving at once as a residence and as a place of defense. The castles erected by the feudal lords and princes of the Middle Ages were wonderful structures, able to resist the strongest attacks. The imposing ruins of castles of this kind are still to be seen in England, Germany and France. Where the country permitted it, the castle was located on the top of a hill or on the summit of a lofty and inaccesible crag, and where there were only level lands it was surrounded by a moat or ditch that sometimes comprised several acres, across which a drawbridge was hung so that it could be raised in times of defense. Behind it was the outer wall, generally of great height and thickness, strengthened with towers at regular distances and pierced with loopholes through which missiles could be discharged at the assailants. The main entrance through the outer wall was protected by the *barbican,* with its narrow archway and strong gates, and the *portcullis,* raised and lowered by chains and weights. Inside there were usually an outer and an inner court, and the strong, more or less detached building known as the *keep,* also called the *dungeon* or *donjon,* which formed the residence of the owner and his family. This was the most strongly constructed of all the buildings, to which the defenders retreated only in the last extremity. The walls were all strengthened by towers, either circular, square, oblong or many-angled, projecting both outward and inward. Such towers were capable of being defended independently of the castle. The invention of gunpowder was the doom of the castle, and now only a few remain habitable.

Castle Gar′den, a large building in Battery Park, in New York City. It served first as a fort, and then it was used as a public hall for assemblies and concerts. Jenny Lind made her début in America here. In 1855 Castle Garden became the landing place for immigrants. In 1890 it was given to the city and has since been used as a public aquarium.

Castlereagh, *kas″l ra′,* ROBERT STEWART, Viscount, second Marquis of Londonderry (1769–1822), an English statesman. At the time of the union of the Irish Parliament with that of England, which Castlereagh helped to bring about, he was transferred to the British Parliament. In 1805 he was made secretary of state of the departments of war in the colonies, and although he resigned the following year he again became minister for war in 1807. The attacks of George Canning on Castlereagh's policy led to a duel between the two politicians. When Castlereagh came to office as secretary for foreign affairs in 1812, England was engaged in the war against Napoleon, and Castlereagh's influence was perhaps stronger that that of any other one man in holding together the coalition against France. He was present at the Congress of Vienna, at the Congress of Paris and at the Congress of Aix la Chapelle, and was preparing in 1822 to attend a congress at Verona when, in a fit of insanity, he committed suicide.

Cas′tor and Pol′lux, in Greek mythology, twin gods, the sons of Jupiter and Leda, known also as Dioscuri. Pollux was immortal, and when his mortal brother was killed in battle, he begged to be allowed to give up his own life for his brother's. Jupiter, moved by this devotion, permitted the brothers to spend alternate days on earth and in the lower world.

Castor Oil, the oil obtained from the seeds of a plant, a native of India, but now distributed over all the warmer regions of the globe. The oil is obtained from the seeds by bruising and pressing. The oil that first comes away, called cold-drawn castor oil, is reckoned the best. The castor oil of commerce, which is used as a purgative, is chiefly imported from India. The plant is often cultivated in gardens for ornament.

CASTOR OIL PLANT

Casuarina, *kazh'-u a ri'na,* a genus of peculiar plants that have jointed leafless stems and branches that make the tree look like giant horse-tail rushes. There are both shrubs and trees in the genus and one of the latter grows to the height of a hundred fifty feet and furnishes a valuable wood. They are almost wholly natives of Australia, where they are known as *cassowary trees* or *swamp oaks.*

Cat, a well-known domestic animal, the same name being also given to the family that includes such animals as the lion, tiger, panther and common cat. It is believed that the cat was originally domesticated in Egypt, where it was loved and venerated. The domestic cat belongs to a genus better armed for destruction of animal life than any other quadrupeds. The short and powerful jaw, sharp, pointed teeth, sharp claws and strong muscles make it a fierce enemy of birds and other small animals. Besides, its cunning disposition, its habit of searching for its prey at night, for which purpose its eyesight is naturally adapted, and its great patience in pursuit of its prey, make it generally successful. Birds have no greater enemy, and one cat often drives the beautiful, friendly singing birds from a whole neighborhood.

ANGORA CAT

EGYPTIAN CAT

The cat is usually regarded as less intelligent than the dog, but possibly it has equal intelligence of another kind. It seems to have little real affection for mankind, though it enjoys being petted and shows signs of jealousy if neglected. It does become strongly attached to places, and it often will desert its friends who have removed, and return to the strangers who occupy its old home. Among the various breeds or races of cats, the *tailless cat* of the Isle of Man, and the *Persian cat,* with its long, silky fur, are among the most curious. The *tortoise shell,* with its color a mixture of black, white and brownish or fawn color, the large *Angora* and the *blue,* or *Carthusian,* and *Maltese* cats, with long, soft, grayish-blue fur, are other species well known to those who fancy the animals. For other animals in this family see JAGUAR; LION; TIGER; PANTHER; WILDCAT.

Catacombs, *kat'a kohmz,* caves or subterranean places for the burial of the dead, the bodies being placed in graves or recesses hollowed out in the sides of the cave. Caves of this kind were common among the Phoenicians, Greeks, Persians and many Oriental nations. In Sicily and Asia Minor numerous excavations have been discovered, containing sepulchers, and the catacombs near Naples are remarkably extensive. The term is said to have been applied originally to the district near Rome which contains the chapel of Saint Sebastian, in the vaults of which, according to tradition, the body of Saint Peter was first deposited; but usually, in speaking of the catacombs, we mean those subterranean burial places just outside the walls of Rome, which were made by the early Christians. They consist of long, narrow galleries, usually about eight feet high and five feet wide, which branch off in all directions, forming a perfect maze of corridors. When one story of them was no longer sufficient, staircases were made, and a second line of galleries was dug out beneath. The graves, or *loculi,* were cut into the walls of the gallery, one above another, to receive the bodies. They were closed laterally by a slab, on which there was occasionally a brief inscription or a symbol, such as a dove, an anchor or a palm branch, and sometimes all of these. The decorations have given us our chief information concerning art during the first four centuries of the Christian era. Some of the inscriptions and epitaphs are beautifully carved, some are merely scratched upon the slab and others are painted in red and black. In later times beautiful frescoes were common, in which are indicated the Christian faith and devotion. It is now regarded as certain that in times of persecution the early Christians frequently took refuge in the catacombs, since burial places had the right of protection by law, and gathered there to celebrate in secret the ceremonies of their religion. In early times rich Christians constructed underground burying places for themselves and their brethren, which they held as private property under the protection of the law. But in course of time, partly because catacombs came under the control of the Church and partly by accidents of proprietorship, these private burying grounds were connected with one another and became the property, not of particular individuals, but of the Christian community. In the third century A. D. there were already several such common burying places belonging to the Christian congregations, and their number increased till the time of Constantine, when the catacombs ceased to be used as burying places.

The term catacombs has also been applied to certain ancient subterranean quarries in Paris, which have been used since 1786 as burial places. It is said that six million bodies lie in these catacombs, where the bones are arranged in fanciful designs along the sides of the passages.

Catalani, *kah′ta lah′ne,* Angelica (1780–1849), one of the most celebrated of Italian female singers. She made her first appearance on the stage at Venice in her sixteenth year. After filling the chief soprano parts in the best opera houses of Italy, she visited, successively, Madrid, Paris and London, enjoying everywhere great professional triumphs. Her voice had a range of nearly three octaves and rarely, if ever, has been excelled in sweetness, richness or flexibility. She retired in 1827, and soon after she established a free singing school for talented girls, near Florence, Italy.

Cat′alep′sy, a condition in which a person suddenly becomes unconscious and remains rigidly fixed in the attitude which he had assumed when the attack seized him. The attack may terminate quickly or it may continue for some time; the latter is liable to be the case when insane persons are attacked. The action of the heart and lungs continues, and the pulse and temperature remain natural. Catalepsy is generally the consequence of some other disease.

Catal′pa, a genus of trees, with simple leaves and large, gay, trumpet-shaped flowers. Some are natives of Japan and China, while others belong to the United States. They have been introduced into England and other parts of Europe and are popular ornamental trees.

Cat′amaran′, a sort of raft used in the East Indies, Brazil and elsewhere. Those of the island of Ceylon, like those of Madras and other parts of that coast, are formed of three logs lashed together. Their length is from 20 to 25 feet and their breadth is 2½ to 3½ feet. The name is also given to a sort of double-hulled pleasure boat remarkable for its speed.

CATAMARAN

Cat′amount, the wild cat. The name is also given to the tiger and the puma. See Wild Cat.

Catania, *ka tah′ne a,* a city on the east coast of Sicily, in the province of Catania, at the foot of Mount Etna, 31 mi. n. n. w. of Syracuse. It has been repeatedly visited by tremendous earthquakes, one of the worst of which was in 1693, when it was almost entirely destroyed; and it has been partially laid in ruins by lava from eruptions of Mount Etna. The city was one of the most flourishing of Greek cities in Sicily and was important under the Romans. The ruins of the amphitheater, which was more extensive than the Colosseum at Rome, are still to be seen, as are the remains of the theater, baths, aqueducts, sepulchral chambers, hippodrome and several temples. Catania has a considerable trade, and it manufactures silk and other fabrics, besides lava and amber ware. It exports grain, fruits, sulphur and wine. Population in 1901, 138,035.

Cat′apult or **Cat′apul′ta,** a machine which the ancients used to throw missiles, chiefly arrows or heavy stones. Catapults may be described as a kind of gigantic crossbow. See Slings, for the toy weapon used by American boys.

Cat′aract, a disease of the eye, in which the crystalline lens, or its covering, becomes opaque and causes partial or entire blindness. The earliest approach of cataract is marked by a loss of the natural color in the pupil, which, as the disease progresses, appears to have a milk-white or pearly color. Cataract is most common in old or elderly people and is quite painless. It is treated by different surgical operations, all of them consisting in removing the diseased lens from its position opposite the transparent cornea. No medical treatment is successful.

Cataract or **Waterfall,** the descent of a stream over a ledge or precipice occurring in its course. Slight cataracts like those in the Saint Lawrence River are called *rapids,* but some rapids are called cataracts, as the Cataracts of the Nile. A cataract is caused by a harder layer of rock, which does not wear away as rapidly as the formations below. The river gradually wears down the channel below this obstruction, and this creates a rapid or fall, according to the nature of the formation and the slope of the bed. In case of a deep, narrow channel worn below the projecting rock, a waterfall with nearly vertical descent is the result, like the falls at Niagara and Victoria Falls in the Zambesi, Africa. When a series of obstructions occurs, one below the other, rapids are formed. Cataracts are most numerous in mountain streams, where many of them are of great height and of remarkable beauty. The largest cataracts in the world are Victoria Falls in Africa, which are about a mile wide and nearly four hundred feet high; and Niagara Falls, which have a width of over four thousand feet and a height of 160 feet. See Niagara Falls; Victoria Falls.

Catarrh, *ka tahr′*, an increased secretion of mucus from the membranes of the nose, throat, bronchial tubes or other parts of the body. Catarrh, as popularly recognized, is a disease of the nasal passages, throat or bronchial tubes only, but it is known by physicians to result wherever the mucous membrane becomes inflamed, whether caused by exposure to cold, the breathing of impure air, constipation or other agency.

Cataw′ba, a tribe of indians, now practically extinct or mingled in blood with the whites, who formerly inhabited North and South Carolina. Pontiac was a descendant of the Catawbas. In general the tribe was friendly to the whites.

Catawba River or **Great Catawba River,** a river in North Carolina, rising in the Blue Ridge. Below Rocky Mount, S. C., the stream is called the Wateree. The Catawba is about 250 miles long.

Cat′bird, a common American thrush, so named becaused one of its calls sounds like the mewing of a cat. It is found throughout the Northern and Middle states, in thickets and shrubberies, where it lives an active existence, chiefly in the pursuit of insects. Its plumage is a deep slate color above and lighter below, with a reddish-brown patch on the lower tail coverts. Its song is varied and fine, largely in imitation of the songs of other birds. In winter it retires to the extreme southern parts of the United States, or even to Mexico and Central America.

CATBIRD

Catechism, *kat′e kiz′m,* an elementary book containing a summary of principles in any science or art, but particularly in religion, reduced to the form of questions and answers. The first regular catechisms appear to have been compiled in the eighth and ninth centuries, those by Kero of Saint Gall and Otfried of Weissenburg being most famous. Among Protestants the catechisms of Luther (1518, 1520 and 1529) acquired great celebrity and continue to be used in Germany. The catechism of the Church of England in the first book of Edward VI, March 7, 1549, contained merely the baptismal vow, the creed, the ten commandments and the Lord's prayer, with explanations. The part relative to the sacraments was added at the revision of the liturgy, during the reign of James I. The catechism of the Church of Scotland is that agreed upon by the Assembly of Divines at Westminster, with the assistance of commissioners from the Church of Scotland and approved of by the General Assembly in the year 1648. What is called the *Shorter Catechism* is merely an abridgment of the *Larger* and is the one in most common use. The best known catechism among Protestant Dissenters was that of Doctor Watts.

Cat′ego′ry, in logic, one of the fundamental principles underlying every thought and used in the organization of all knowledge. The ancients, following Aristotle, held that all beings or objects of thought may be referred to ten categories, namely: *substance*, *quantity*, *quality*, *relation*, *action*, *passion*, *time*, *place*, *situation* and *habit*. Plato admits only five: *substance*, *identity*, *diversity*, *motion* and *rest*; the Stoics found four: *subjects*, *qualities*, *independent circumstances*, *relative circumstances*. Descartes suggested seven divisions: *spirit*, *matter*, *quantity*, *substance*, *figure*, *motion* and *rest*. Others make but two categories, *substance* and *attribute*, or *subject* and *accident*; or three, accident being divided into the *inherent* and the *circumstantial*. In the philosophy of Kant the term *categories* is applied to the primitive conceptions, originating in the understanding independently of all experience. These he divides into four classes: *quantity*, *quality*, *relation* and *modality*. J. S. Mill applies the term categories to the most general heads, under which everything that may be asserted of any subject may be arranged. Of these he makes five: *existence*, *co-existence*, *sequence*, *causation* and *resemblance*.

Cat′ena′ry Curve, the curve which is formed by a heavy cord of the same density and thickness throughout, when suspended between two points, with no pressure exerted on it save that of gravity. It is of chief interest and importance in the theory of arches and suspension bridges.

Cat′erpil′lar, the larva or worm of butterflies and moths. The caterpillar has usually twelve segments or rings, not including the head, and is provided with strong, biting jaws that are in striking contrast with the mouth organs of the adult insect. It has three pairs of five-jointed legs, and other rudimentary stumps of legs on the abdomen. The body may be naked or covered with hairs, bristles or spines, which in caterpillars living an exposed life are usually brightly colored. The skin of the hairless species is often beautifully marked lengthwise or crosswise, or with ringed spots and eye-spots. The large head has six eye-spots on each side, a pair of short, three-jointed feelers, besides jaws and other mouth organs. Glands, some with unpleasantly odorous or stinging secretions, frequently occur on the skin. Most caterpillars live an active life, some roaming only at night, however, and their movements are usually upward. Some forms eat flesh, but the majority of them feed upon vegetation, and in some cases their ravages are almost intolerable. See LARVA.

Cat′fish, a large family ot fishes inhabiting both fresh and salt water. All species are characterized by their smooth skin and the sharp spines, or thorns, at each side of the head, which, when the fish is frightened or attacked, are erected at right angles to the body. The fresh-water species in the United States are often known as *horned pout* and *bullhead*. The largest of these species, the Mississippi catfish or bullhead, is abundant in the lower Mississippi and its tributaries. Specimens weighing 150 pounds have been taken, but the average weight is about 35 pounds. The flesh has a sweet flavor and is highly nutritious.

Cat′gut, a cord made from the intestines of sheep, and sometimes from those of the horse, ass and mule, but not from those of the cat. The manufacture is chiefly carried on in Italy and France, by a tedious process. Catgut is used in the manufacture of the strings of harps, violins and other musical instruments and various other articles. The best strings are made in Milan and Naples, Italy.

Cath′arine I (?–1727), empress of Russia. She was the daughter of poor parents, who died when she was three years old. In 1701 she married a dragoon of the garrison of Marienburg, and when the town was taken by the Russians in 1702, she was sent with others to Moscow, where she first saw Peter the Great. She acquired a great influence over him, and in 1712 he married her. In 1724 she was crowned at Moscow, and on her husband's death she became empress.

Catharine II (1729–1796), empress of Russia. In 1745 she was married to Peter, nephew of the empress Elizabeth. Peter came to the throne on the death of Elizabeth in 1762, but Catharine, with the assistance of her lover, Gregory Orloff, and others, won over the guards, and after Peter had reigned for a few months he was deposed, thrown into prison and afterward killed, while Catharine was proclaimed empress. On the death of Augustus III of

Poland she caused one of her favorites to be placed on the throne, and by this she profited in successive partitions of that country. By the war with the Turks, which occupied a considerable part of her reign, she conquered the Crimea and opened the Black Sea to the Russian navy. Her dream, however, of driving the Turks from Europe and restoring the Byzantine Empire was not to be fulfilled. She improved the administration of justice, ameliorated the condition of the serfs, constructed canals, founded the Russian Academy and in a variety of ways contributed to the enlightenment and prosperity of the country. Her enthusiasm for reform, however, was summarily checked by the events of the French Revolution; and the dissipation and extravagance of her court were such that there was a danger of its exhausting the Empire.

Catharine de' Medici (1519–1589), the wife of Henry II of France, and the daughter of Lorenzo de' Medici. She married the duke of Orleans, afterward Henry II, and was the mother of four sons, three of whom became kings of France. During the reign of her eldest son, Francis, she began to be prominent in state affairs, and after his death, during her regency for Charles IX, the government was entirely in her hands. Her policy was to keep the two great parties of the Houses of Guise and Condé fighting against each other, taking care that neither should obtain the balance of power. Finally, finding that the House of Condé under the leadership of Admiral Coligny was becoming too strong, she entered into a plot with the Guises which resulted in the massacre of Saint Bartholomew's Day. See BARTHOLOMEW'S DAY, SAINT.

Catharine of Aragon (1485–1536), queen of England, the youngest daughter of Ferdinand of Aragon and Isabella of Castile. In 1501 she was married to Arthur, prince of Wales, son of Henry VII. Her husband died about five months after the marriage, and Henry VII, unwilling to return her dowry caused her to be married to his remaining son, Henry, procuring a dispensation from the pope for that purpose. On the accession of Henry to the throne as Henry VIII in 1509, she was crowned with him, and despite the inequality of their ages retained her ascendency with him for nearly twenty years. Her children, however, all died in infancy, excepting Mary, and on the advent of Anne Boleyn, Henry affected to doubt the legality of his union with Catharine. See HENRY VIII.

Cathe'dral, the principal church of a diocese, so called from the fact that it possesses the episcopal chair or *cathedra.* This is really what distinguishes a cathedral from other churches, though most cathedrals are also larger and more elaborate structures than ordinary churches and have various dignitaries and functionaries connected with them. As regards architecture, cathedrals naturally vary much, both in style and plan. Those in England are almost all in the Gothic style and cross-shaped in arrangement, having connected with them a chapter house, side chapels, cloisters and crypt. This style and arrangement is also common on the continent of Europe, and in most modern cathedrals, though other styles of architecture have been freely employed. The cathedrals furnish the most magnificent examples of the architecture of the Middle Ages. Among the most noted are the cathedral at Milan; the cathedral at Florence, begun about 1294, one of the finest specimens of the Italian-Gothic style; the Cologne cathedral, the cathedral of Notre Dame at Paris, and those of Amiens, Chartres and Rheims. The most noteworthy English cathedrals are Saint Paul's, London, dating from the seventeenth century, and those of Canterbury, Ely, Exeter, Lichfield, Lincoln, Norwich, Salisbury, Wells and York. The cathedrals of Glasgow and Kirkwall are the only entire cathedrals in Scotland, exclusive of modern edifices In the United States the Roman Catholic Cathedral of Saint Patrick's, in New York, is the finest. It was built at a cost of about two and a half million dollars. This will be surpassed in size and grandeur by the Episcopal Cathedral of Saint John the Divine in New York City, now in process of erection. The Church of Saint Peter in Rome is often mistakenly called a cathedral (See SAINT PETER'S CHURCH). See MILAN CATHEDRAL; COLOGNE CATHEDRAL; NOTRE DAME, CATHEDRAL OF; CANTERBURY; LINCOLN CATHEDRAL.

Cath'etom'eter, an instrument for measuring exact differences of level between two points. In its simplest form it consists of a vertical graduated rod, upon which slides a horizontal telescope. With the telescope the observer sights the two objects under examination, and the distance on the graduated rod moved over by the telescope is the measure of the distance of height between the two objects.

Cath'ode Rays, rays thrown off by the cathode, or negative electrode, in an atmosphere of extremely rarified air or other gas. The simplest form of apparatus for producing cathode rays consists of a cylindrical glass tube from which the air has been exhausted and which has platinum wires inserted at each end. When such a tube is connected with the poles of an induction coil or an electrical machine, the discharge passes from one platinum point to another in the form of a brush of blue light or of a red, threadlike pencil of rays extending from one electrode to the other. In a tube from which the air has not been exhausted, the discharge takes the form of a spark. In the most perfect vacuum, all rays disappear and the tube seems filled with a green light, caused by the rays from the cathode. This apparatus is used in the production of the Roentgen rays, or X-rays, and the N-rays. See CROOKES'S TUBES; ROENTGEN RAYS; N-RAYS.

Catholic Church, a phrase equivalent to *universal church.* It was first employed to distinguish the Christian from the Jewish Church, the latter being restricted to a single nation, while the former was intended for the world in general. The name has been retained by the Church of Rome, which was the successor of the primitive church. To the adherents of this faith, the name is peculiarly significant of the characteristics of the Church—unity, visibility, indefectibility, succession, universality and sanctity. The expression is often qualified, especially by those not in the Church, by prefixing the word *Roman.* The Episcopalians claim for themselves the title *Catholic*, but it is, however, popularly used in almost all countries as synonymous with *Roman Catholic.* See CREED; POPE; ROMAN CATHOLIC CHURCH.

Catholic University of America, a university at Washington, D. C., under the auspices of the Roman Catholic Church in the United States. It was incorporated and received its constitution from Pope Leo XIII, and was opened for instruction in 1889. The courses of study are intended primarily to give professional training, and to offer to graduates of Catholic seminaries and colleges facilities for original research. The faculty numbers over thirty and the enrollment exceeds 200. Cardinal Gibbons was chancellor from its foundation.

Cat'iline, (in full, Lucius Sergius Catilina) (108–62 B. C.), a Roman conspirator, of patrician rank. In his youth he attached himself to the party of Sulla, but his physical strength, passionate nature and unscrupulous daring soon gained him an independent reputation. He was elected praetor in 68 B. C. and governor of Africa in 67. In 66 he returned to Rome to contest the consulship, but was disqualified by an impeachment for maladministration in his province. He was deeply in debt, and, urged on by his necessities as well as his ambition, he entered into a conspiracy with other disaffected nobles. The plot, however, was revealed to Cicero, and measures were at once taken to defeat it. Thwarted by Cicero at every turn and driven from the senate, Catiline fled and put himself at the head of a large but ill-armed following. The news of the suppression of the conspiracy and the execution of the ringleaders at Rome diminished his forces, and he led the rest toward Gaul. A Roman force surrounded the rebels and, driven to bay, Catiline turned upon the enclosing army and died fighting.

Cat Island, one of the Bahama Islands, about 46 miles in length and 3 to 7 in its breadth. It was long thought that it was the Guanahani, or San Salvador, where Columbus first touched the New World in 1492.

Cat'lin, GEORGE (1796–1872), an American writer and painter of the indians, born in Wilkesbarre, Pa. After practicing as a lawyer for two years, he set up at New York as a portrait painter; and in 1832 he commenced special studies of indian types, living among them many years both in North and South America. His finely illustrated works are *Manners, Customs and Condition of the North American Indians*; *North American Portfolio*; *Eight Years' Travel in Europe*; *Last Rambles among the Indians.* Most of his paintings are now in the famous Catlin Gallery of the National Museum.

Cat'nip or **Cat'mint,** a plant of the mint family, widely diffused throughout North America and Europe. It grows erect to a height of two or three feet, has whorls of rose-tinged, whitish flowers, and stalked, downy, heart-shaped leaves. It has much the same fascination for cats as valerian root.

Ca'to, MARCUS PORCIUS (95–46 B. C.), a Roman soldier and statesman, called Cato of Utica, from the place of his death, to distinguish him from the censor, his great-grandfather. He earned a reputation as a volunteer in the war against Spartacus, served as military tribune in Macedonia and was made quaestor in 65 B. C. His rigorous reforms won him general respect, and in 63 B. C. he was chosen tribune of the people. During the troubles with Catiline, Cato gave Cicero important aid, and at the same time he set himself to thwart the ambitious projects of Pompey, Caesar and Crassus. To get rid of him, they sent him to take possession of Cyprus, but after successfully accomplishing his mission, he returned, opposed the law for conferring extraordinary powers on the triumvirs, and in 54 B. C. enforced a law against bribery. On the breach between Pompey and Caesar, he joined Pompey. After receiving news of Pompey's defeat at Pharsalia, he sailed to Cyrene and effected a junction with Metellus Scipio at Utica. He took command of that city, but, its defense appearing hopeless after the defeat of Scipio, he stabbed himself with his sword.

Cato, MARCUS PORCIUS (surnamed Priscus, the Elder, and Sapiens, the Wise) (234–149 B. C.), a celebrated Roman statesman. He inherited from his father, a plebeian, a small estate in the territory of the Sabines and spent the early years of his manhood in its cultivation. At the age of seventeen, he served his first campaign under Fabius Maximus, was present at the siege of Capua and in 207 B. C. fought at the siege at Tarentum. After the war was ended he returned to his farm, but later, by the advice of Valerius Flaccus, removed to Rome, where his forensic abilities had free scope. He rose rapidly in rank, accompanied Scipio to Sicily as quaestor, became an aedile and in 198 was chosen praetor and appointed to the province of Sardinia. Three years later he gained the consulship, and in 194 for his brilliant campaign in Spain obtained the honor of a triumph. In 191 he served as military tribune against Antiochus and then returned to Rome. For some years he exercised a practical consorship, scrutinizing the characters of candidates for office and denouncing false claims and peculations. His election to the censorship in 184 set an official seal to his efforts, the unsparing severity of which has made his name proverbial. From that year until his death he held no public office, though zealously continuing his unofficial labors for the state.

Cat's-eye, a mineral, a variety of quartz, very hard and semi-transparent, and from certain points exhibiting a yellow internal radiation resembling a cat's eye. It is found in Ceylon and Malabar, and when cut and polished forms a gem of considerable value.

Cat'skill, N. Y., the county-seat of Greene co., 34 mi. s. of Albany, on the Hudson River, at the mouth of the Catskill Creek, on the Catskill Mountain railway, and with ferry connection to the New York Central on the eastern side of the Hudson. The village is a summer resort and an important point of departure from the steamship lines for many mountain resorts. It has manufactures of woolens, hosiery, paper and bricks. The place was settled about 1680 by the Dutch. Population in 1910, 5296.

Catskill Mountains, a fine range of mountains in New York State. They lie on the west side of, and nearly parallel to, the Hudson, from which their base is, at the nearest point, 8 miles distant. Their length is 50 miles and their width 30 miles. The two most elevated peaks are Mountain Slide, 4250 feet, and Hunter Mountain, 4025 feet. The Dunderberg is the scene of Washington Irving's *Rip Van Winkle.* The Catskills are noted for the beauty of their scenery.

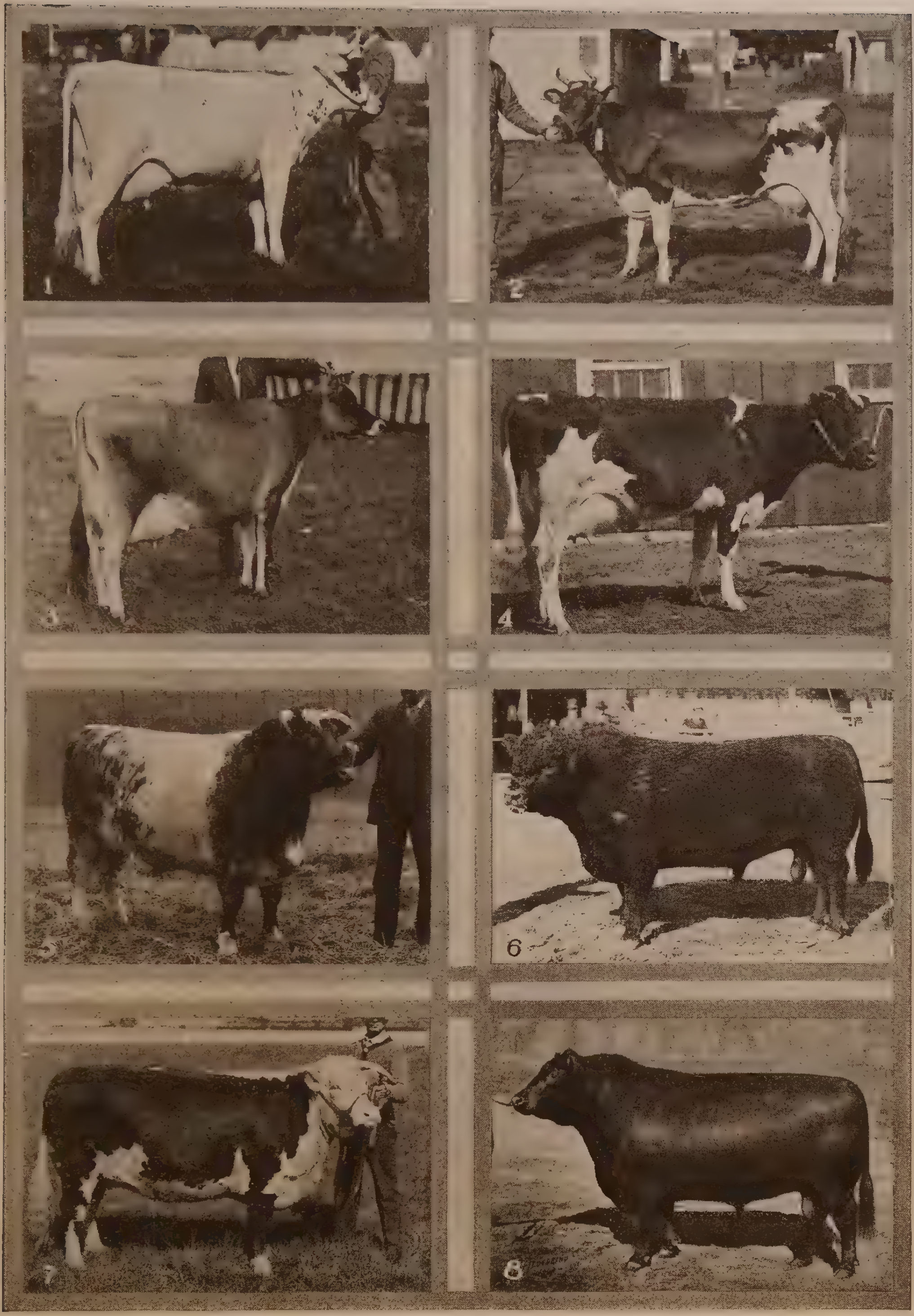
Cat'sup. See KETCHUP.

Cat'tegat or **Kat'tegat,** a large gulf of the North Sea, between Denmark and Sweden. It is about 150 miles long and 90 miles wide. On account of its many shoals and its frequent storms, it is dangerous for navigation. The Cattegat is noted for its herring fisheries.

Cat'tle, a term which in its broadest sense applies to all domestic animals, but as ordinarily used includes only the animals of the ox family—oxen, cows and steers. Cattle have been domesticated from the earliest times, and it is probable they were among the first animals tamed by man. It is supposed that our varieties were obtained from the wild cattle found centuries ago in Europe and Great Britain. There are now about 100 different breeds of domestic cattle. The best of these come from Great Britain, where they have been carefully bred for many years. Most of the breeds take their names from the locality in which they originated. All may be roughly classified into two groups, those that excel in the quality and quantity of milk, and those that are prized for beef.

The first cattle introduced into America were brought to Mexico by the Spaniards about 1525. These increased rapidly and were the progenitors of the Texas cattle, now found in large numbers in that state and New Mexico and Arizona. The English and Dutch colonists also imported cattle soon after their respective settlements, so that within a few years from the time American colonies were established, the farms were well stocked with cattle.

Among the best-known breeds of beef cattle, the *Shorthorns* or *Durhams* excel, and they now outnumber all other breeds for beef purposes. Their color is red and white, or roan. They are squarely built, heavy animals. They fatten



GRAND CHAMPIONS OF THE INTERNATIONAL STOCK SHOW, CHICAGO, ILL.

1. Ayrshire Cow.
2. Guernsey Cow.
3. Jersey Cow.
4. Holstein Cow.
5. Short Horn Steer.
6. Galloway Bull.
7. Hereford Cow.
8. Polled Angus Bull.

easily, there is comparatively little waste in killing and their flesh is excellent. Next to the Durhams are the *Herefords*, which are good beef cattle, but interior in milk-giving qualities. They are, however, good travelers and are well adapted to the large ranches where they must go some distance for water. Among the best breeds of dairy cows are the *Galloways*, which are natives of the lowlands of Scotland; the *Jerseys*, which came from the island of Jersey in the English Channel and are noted for their rich milk; the *Holsteins*, originally from the northern part of Germany, noted for the quantity of milk they give, and the *Ayrshires*, which produce a large quantity of milk of excellent quality. See BEEF; MEAT PACKING; MILK.

Catul'lus, GAIUS VALERIUS (about 87–about 54 B. C.), a famous Roman lyric poet. Almost all the known details of his life are derived by inference from his works and relate to such matters as his passion for Lesbia, his journey to Bithynia, his voyage home in his yacht and his pleasant villa. He was the first of the Romans who successfully caught the Greek lyric spirit, and he gave to Roman literature its most genuine songs.

Cauca, *kow'ka,* a river in Colombia, South America, an important tributary of the Magdalena. In the upper part of its course it contains numerous falls, but in the lower part it is navigable. It gives its name to the province through which it flows. Its length is about 700 miles.

Caucasian, *kaw ka'shan,* **Race.** See RACES OF MEN.

Cau'casus, a range of mountains extending from the Black to the Caspian Sea and forming one of the natural barriers between Europe and Asia. The length of the main range is 940 miles, and the width of the system varies from 30 to 130 miles. The greatest height is attained in the center, where there are said to be more than twenty peaks exceeding Mont Blanc in altitude. Of these Elburz, 18,470 feet, is the highest. The lower slopes are covered with dense forests, mostly of evergreen, and the scenery is grand and gloomy.

Cau'cus, a term applied to a meeting of members of a political party to agree upon candidates for office, or to propose party measures. Its origin is referred to an affray between some British soldiers and some Boston rope makers in 1770, which resulted in meetings of rope makers and *caulkers*, called by the Tories *caucus* meetings. The species of caucus first named above has gradually changed from an informal gathering to one at which secret votes are cast, as at general elections, under the influence of laws to prevent corruption. The second kind of caucus is still much used in legislative bodies, to determine the policy of the party representatives, and to choose candidates for office in the body. Until 1824 candidates for president and vice-president were chosen by caucuses of members of Congress.

Cau'liflower, a garden variety of cabbage, in which cultivation has caused the flowers to assume, when young, the form of a compact, fleshy head, which is highly esteemed as a table vegetable. Broccoli is a similar variety.

CAULIFLOWER

Caulking. See CALKING.

Caus'tic, a name given to substances which have the property of burning, corroding or disintegrating animal or vegetable matter. *Lunar caustic* is a name given to nitrate of silver when cast into sticks for the use of surgeons. *Caustic potash* is the hydrate of potassium; *caustic soda*, the hydrate of sodium.

Cavaliers, *kav a leerz',* (horsemen), a name applied in history to the partisans of Charles I of England, as opposed to *Roundheads*, the name given to the adherents of the Parliamentary cause.

Cav'alry, a body of troops which serve on horseback; one of the three great classes of troops, and a formidable power when properly employed (See INFANTRY; ARTILLERY). Cavalry is well adapted to speedy movements, which enable a commander to avail himself of a decisive moment and strike quickly whatever weak point an enemy exposes. It is serviceable, too, in protecting the wings and center of an army; for intercepting the supplies of the enemy; for procuring intelligence; for covering a retreat, and for foraging, as well as for many another purpose. Cavalry was an important arm of the service with the Greeks and Romans, but the Oriental armies seem to have used war chariots rather than cavalry. In medieval times mounted knights practically displaced infantry, and caused the true value of concerted cavalry action to be forgotten; but under Charles XII of Sweden and Frederick the Great of Prussia, the value of cavalry was again recognized and it was established in the important, though subordinate, position which it now holds. The cavalry has been armed usually with sabers and lances, but the destructiveness of modern firearms is leading to a change, so that now cavalry is being armed with revolvers and rifles and trained to make rapid marches and, if necessary, fight on foot as infantry. See TACTICS.

Cave or **Cav′ern,** an opening of some size in the solid crust of the earth beneath the surface. Caves are principally met with in limestone rocks, sometimes in sandstone and in volcanic rocks. Some have been formed by the upheaval of the earth's crust, which caused some strata to slide over others in such a way as to leave caverns beneath. The size of these caverns may have been increased by the action of water. The caves in volcanic regions were undoubtedly formed while the lava was in a plastic state; and they are supposed to be due to the expansion of gas, which formed caverns in the rock in a manner similar to that in which pores are formed in bread while baking. But water is the most important agency in the formation of caves, and most of the large caverns have been formed by its action. Caverns of this nature are generally found in limestone regions.

Some caves are of great extent, such as Mammoth Cave, in Kentucky, which has more than 150 miles of passageways. Others are remarkable for their depth. The most noted of these is the Frederikshall, in Norway. The Wyandott Cave, in Crawford County, Ind., and the Luray Caverns, in Page County, Va., are celebrated for their beautiful stalactites and stalagmites (See STALACTITE). Fingal's Cave, on the Island of Staffa, is remarkable for the basaltic columns forming its walls and roof.

Many caves contain the remains of animals, some of which are extinct, and some of which show that the animals living in the region at the time were similar to those now found in different parts of the world, as the remains of the reindeer and hyena, which are found in some caves in southern Europe. The reindeer now lives only in the high latitudes, and the hyena is found in South Africa. In some of these caves human bones are found intermingled with those of the animals, as are pieces of charcoal and rude implements, showing that men lived upon the earth at the same time as the animals whose skeletons are found.

See FINGAL'S CAVE; LURAY CAVERNS; MAMMOTH CAVE; WYANDOTT CAVE. Consult Shaler's *Aspects of the Earth.*

Cave Dwel′lers, a term carelessly applied to prehistoric races who lived in caves. They were at a low state of civilization, were ignorant of the metals, of pottery and of agriculture, and had no domestic animals. Traces of such early men are found in so many countries that it is often thought that all people at one time in their history dwelt in caves. Yet no such conditions ever existed in America, except where caves were used as places of refuge by hunted indians.

Cav′endish, HENRY (1731–1800), an English physicist and chemist. He devoted himself exclusively to science and greatly contributed to the progress of chemistry, having discovered, among other things, the peculiar properties of hydrogen and the composition of water He also wrote on electricity and determined the mean density of the earth.

Cavendish, THOMAS (about 1555–1592), an English navigator of the reign of Elizabeth. Having collected three small vessels for the purpose of making a voyage against the Spanish colonies, he sailed from Plymouth in 1586, took and destroyed many vessels, ravaged the coasts of Chile, Peru and New Spain and returned by the Cape of Good Hope, having circumnavigated the globe in two years and fifty days, the shortest period in which it had been effected. In 1591 he set sail on a similar expedition, during which he died.

Caviar, *kav′e ahr,* or **Caviare,** *kah veer′,* a food prepared from the roe of the sturgeon. Caviar is made by freeing the eggs from the tissue which holds them together, then washing them and rubbing them with salt, after which they are dried and packed in kegs. It is considered a great delicacy, especially among the Russians, in whose country it is manufactured in large quantities. The abundance of sturgeon in the Great Lakes has given rise to the manufacture of caviar in some parts of the United States.

Cavite, *ka ve′ta,* a town of the Philippine Islands, capital of the province of Cavite, situated on Luzon Island, 8 mi. s. w. of Manila. The theater and cathedral are the most important public buildings. The manufacture of tobacco is the leading industry. It was an important naval station under Spanish rule, and it was near Cavite that Admiral Dewey first attacked the Spanish fleet, May 1, 1898. It is now the naval headquarters of the United States in the Philippines and has arsenals, repair shops and dry docks. Population, 1903, 4494.

Cavour, *ka voor′*, Count Camillo Benso di (1810–1861), a distinguished Italian statesman. He was educated in the military academy at Turin, and after completing his studies he made a journey to England, where he remained for several years, making himself acquainted with the principles and working of the British constitution and forming friendships with some of the most distinguished men. From his earliest entry into political affairs his chief aim was to unite Italy under a central government, which should be independent of Austria. He became a member of the Sardinian Parliament in 1848, and two years later, minister of commerce and agriculture. In 1852 he became premier, and not long afterward he took an active part in cementing an alliance with Great Britain and France, and making common cause with these powers against Russia during the Crimean War. When the war closed, Cavour was appointed a delegate to the Peace Congress, where he succeeded in winning for his state the recognition of the European powers. He next made preparations for war with Austria, obtained the aid of France, and in 1858, by his hostile attitude, forced Austria to open the struggle. The result was victory for Sardinia, and Cavour was able, with the aid of Garibaldi, to unite all Italy, except Rome and Venice, by the beginning of 1861. He lived to see the meeting of the first Italian Parliament, which decreed Victor Emmanuel king of Italy, but died before Rome and Venice were annexed to the kingdom.

Ca′vy, the name given to several different animals related to the guinea pigs, all of which live in the tropical regions of South America. They are lively little fellows that live principally upon plants, eating in the night time and spending their days underground in their burrows. See Guinea Pig.

Cawnpore′ or **Cawnpur,** *kawn poor′*, a city of India, on the right bank of the Ganges, 628 mi. n. w. of Calcutta. The chief buildings are a theater, a high school, military and government offices and several churches. The industries are the manufacture of cotton goods, leather and other articles, and the city is one of the most important manufacturing centers of India. It is also an important commercial and military point, being one of the largest railway centers. During the Sepoy Rebellion in 1857, this was the scene of the mutiny of the native troops, which resulted in the massacre of many men, women and children. The place was relieved by the British under General Havelock, but not in time to prevent the slaughter of the prisoners. Population in 1901, 197,000.

Cax′ton, William (1422–1491), the man who introduced the art of printing into Great Britain. He served an apprenticeship to Robert Large, a London mercer, on whose death Caxton went into business for himself at Bruges. He had translated the popular medieval romance, *Collection of the Histories of Troy*, and in order to multiply copies he learned the newly discovered art of printing. This work was printed either at Cologne or Bruges about 1474 and is the earliest specimen of typography in the English language. Caxton translated twenty-one books, mainly romances, from the French, and one from the Dutch, helping materially to fix the literary language of the sixteenth century. Among his works were the *Game of Chess* and *Dictes and Notable Sayings of the Philosophers*. He was buried in the Church of Saint Margaret's, Westminster.

Cayenne, *ka en′* or *ki en′*, the capital of the colony of French Guiana, a seaport on an island of the same name, at the mouth of the Cayenne River. It is a noted penal settlement. The harbor is large but shallow. The city was settled by the French in 1627. Population, about 13,000.

Cayuga, *ka yoo′gah*, (swamp dwellers), the smallest of the Five Nations, called the *Youngest Brother*, because they were the latest to join the confederacy. They proved strong enemies to the whites, but after the Revolution most of them settled in Canada, the remainder scattering among the Oneidas and Senecas. See Five Nations, The.

Cayuga Lake, a beautiful lake, situated west of the center of the State of New York. It is 38 miles long and from 1 to 3½ miles wide, and it discharges its waters into Lake Ontario, through the Seneca and Oswego rivers. The principal towns on its banks are Cayuga, Ithaca and Aurora.

Cebu, *se boo′*, or **Zebu,** one of the Philippine Islands, lying between Luzon and Mindanao. It is 130 miles long, 20 miles wide and has an area of 1742 square miles. Sugar, hemp, cotton and rice cultivation and the manufacture of abaca are the chief industries. The town of Cebu, the capital, on the eastern coast of the island, the oldest Spanish settlement in the Philippines, is a place of considerable trade and has a cathedral and several churches. The island was first occupied by the United States in February, 1899, and was given civil government as a province in 1901. Population of the province, 518,000.

Cecil, *ses'il,* William, Lord Burleigh (1520–1598), an English statesman. He was secretary of state under Edward VI, and although as a Protestant he resigned his position on the accession of Mary, he entirely escaped persecution, though he never denied his Protestant tendencies. When Elizabeth came to the throne she chose Burleigh as her secretary of state, and this office he held until his death. The glory of the reign is due to him, as the real director of the policy, more than to any other man.

Cecilia, *se sil'yah,* Saint, the patron saint of music, falsely regarded as the inventor of the organ. She is said to have suffered martyrdom 230 A. D., although other dates are given. In the Roman Catholic Church, her festival (November 22) is celebrated with beautiful music. Her story forms one of Chaucer's *Canterbury Tales,* and Dryden, in his *Alexander's Feast,* and Pope in his *Ode on Saint Cecilia's Day,* have sung her praises. Raphael, Domenichino, Dolce and Mignard have represented her in celebrated paintings.

Cecro'pia, a genus of beautiful South American trees, of the breadfruit order. One of these, the *trumpet-wood,* is remarkable for its hollow stem and branches, which the indians make into drums and wind instruments. The light, porous wood is used by the indians for making fire, by rubbing it against a harder wood. The inner bark is fibrous and strong and is used for cordage.

Cedar, *se'dahr,* the name of several species of evergreen trees belonging to the pine family. Cedars are distinguished by their horizontal, wide-spreading branches, their fine, compact leaves and their reddish wood, which is fragrant and very durable. The famous cedars of Lebanon, so frequently mentioned in the Bible, belong to the most widely known species. Of these trees comparatively few now remain, and they do not grow in any other part of Palestine. The most celebrated group is situated not far from the village of Tripoli, at an elevation of about 6000 feet above the sea. The circumference of the largest trees varies from about 18 to 47 feet. The term cedar is also applied to the deodar, a somewhat similar tree, which is a native of India and often attains a height of 150 feet.

The *white cedar* or *arbor vitae* is common from Canada to North Carolina. It is distinguished by its flat, scale-like leaves and branches, extending horizontally or slanting downward, and its fragrant odor, due to its balsam. The tree often attains a height of 80 to 90 feet, but seldom exceeds 2 feet in diameter. The timber is valuable for cooperage, fence posts and the manufacture of chests for storing furs and other articles which it is desired to protect from insects, since this wood is poisonous to them. The twigs are used in the manufacture of cedar oil. The *red cedar* is found in the swamps of Florida and in other localities in that vicinity. The wood is reddish or yellowish-red and is very durable, especially for uses where it comes in contact with water. Because of the value of its timber this tree has been nearly exterminated in some places. A variety of red cedar, known as the *Bermuda cedar* and found in the West Indies, is extensively used for making the cases of lead pencils.

Cedar Creek, Battle of, the last battle of Sheridan's campaign in the Shenandoah Valley, in 1864, fought on October 19 between two forces of about 30,000 men each. During the early part of the battle Sheridan was absent, having been called to Washington, and the Federals were commanded by General Wright. They were attacked at daybreak by the Confederates, who completely routed a large part of the Union force. With some difficulty Wright reformed his line, though suffering heavy loss. At this time General Sheridan, who had learned of the battle while at Winchester, twenty miles away, met the disheartened Federals, inspired them with new enthusiasm and led an attack which put the Confederates to flight with great loss. It was of Sheridan's experience during this battle that Read wrote his famous poem, *Sheridan's Ride.*

Cedar Falls, Iowa, a city in Black Hawk co., on the Chicago, Rock Island & Pacific, Chicago Great Western and Illinois Central railroads. The city is surrounded by rich farming land, and manufactures flour, house finishings, gates, sleds, brooms and hardware. Abundant and cheap water power has been developed here. A new high school library, a public library and the Iowa State Teachers' College afford unusual educational facilities. The first settlement was made in 1847. Population in 1910, 5012.

Cedar Lake, a lake in Canada, formed by an expansion of the Saskatchewan River just before it enters Lake Winnipeg. It is 30 miles long, 25 miles wide in the widest place and has an area of 312 square miles. The shores are wooded with pine, tamarack and balsam.

Cedar Mountain, BATTLE OF, a battle of the Civil War, fought near Culpepper Court House, Va., Aug. 9, 1862, between a Union force of 8000 under General Banks and a Confederate force of 24,000 under "Stonewall" Jackson. Banks had come upon the rear guard of Jackson's army and attacked it vigorously. Jackson rallied his men and drove back the Union force. The Confederates lost 1300, the Federals, 1800.

Cedar Rapids, IOWA, a city in Linn co., 79 mi. s. w. of Dubuque, on the Cedar River and the Chicago, Rock Island & Pacific, Chicago & Northwestern, Chicago, Milwaukee & Saint Paul and other railroads, including an interurban to Iowa City. It is a beautiful city and has a valuable trade. The industries include packing houses, cereal mills, starch works, pump factories, railroad shops, flour mills, foundries and machine shops. Coe College is located here. The important structures are the public library, the Masonic Temple, Masonic Library and Museum, Y. M. C. A., Consistory Building, the Federal Building and an opera house. It was settled in 1845. The city has the commission plan of government. Population in 1910, 32,811.

Celebes, *sel'e bes*, one of the larger islands of the Indian Archipelago, between Borneo on the west and the Moluccas on the east. The area is 71,000 square miles. Gold is found in all the valleys of the north peninsula, which abounds, also, in sulphur and copper. Tin occurs at various points. Diamonds and other precious stones are found. The chief cultivated products are tropical fruits, spices, corn, rice, tobacco, indigo and sugar. The trade in tropang is very important. The inhabitants may be classed into two groups, the Mohammedan semi-civilized tribes and the pagans, who are more or less savage. The capital is Macassar, in the southwest of the island, and through this port most of the trade of the island passes. In 1660 Macassar was taken by the Dutch, the southern portion of the island was put under Dutch rule and the Portuguese were expelled. The island was conquered by the British in 1811, but a few years later it was again given up to the Dutch, in whose possession it has remained ever since. Population, estimated at 2,000,000.

Celery, *sel'ur y*, a plant of the parsley family, native of the temperate parts of Europe. In its natural state it is bitter, sharp and almost poisonous, but in its cultivated form it is a wholesome vegetable. Celery is commonly blanched by heaping up the soil about the plants. In the United States it is extensively grown, especially in the black loam soils of swampy grounds.

Celestine, *sel'es tin*, the name of five popes of Rome (422–1296).

Celibacy, *sel'i ba sy*, the state of being celibate or unmarried; especially applied to the voluntary life without marriage followed by many religious devotees and by some orders of clergy, as those of the Roman Catholic Church. The ancient Egyptian priests, the priestesses of ancient Greece and Rome and the Buddhist priests of the East made celibacy a rule of life. Among the Christians the earliest aspirants to the spiritual perfection supposed to be attainable through celibacy were not ecclesiastics, as such, but hermits and anchorites.

Cell, *sel*, in biology, the unit of structure of plants and animals. It is a microscopic, semifluid portion of matter, surrounded by a cell wall, in which is contained a soft mass of living, jelly-like matter called *protoplasm*, and a central structure, or organ, consisting of a small roundish body called the *nucleus*, generally more solid than the rest, sometimes having within it a still smaller body called the *nucleolus*. The simplest plants and animals have but one cell, while the more complex have masses of many cells. Cells are nearly spherical in outline, but if pressure is exerted upon them by the other cells, they may take on various modified forms, becoming regularly polygonal, spindle-shaped, cylindrical or star-shaped. The cell substance, or protoplasm, which surrounds the nucleus, is an albuminous substance possessing fundamental vital properties. It is organized into various structures called the *organs* of the cell, each organ having one or more special functions. One of the most conspicuous organs is the nucleus, the most obvious function of which is the governing of the reproduction of the cells. It is generally spherical, but may vary greatly in form and shape.

The cell multiplies by the division of the whole cell into two cells. This process begins at the nucleus. When the cell reaches a certain size, its nucleus divides along a definite line, and the two parts grow to the size of the first and repeat the process. See PROTOPLASM.

Cellini, *chel le'ne*, BENVENUTO (1500–1571), an Italian sculptor, engraver and goldsmith. As the result of a duel he was forced to leave Florence, and afterwards, having gone to Rome, he gained the patronage of Pope Clement VII. Cellini's quick temper and quarrelsome disposition led him into frequent brawls, and he stayed in few places for any length of time. At the court of Francis I of France he modeled the *Nymph of Fontainbleau,* an excellent example of his work. He afterward returned to Florence, and under the patronage of Cosimo de' Medici he made a *Perseus with the Head of Medusa* in bronze, which is still an ornament of one of the public squares, and a statue of Christ, in the chapel of the Pitti Palace, besides many excellent dies for coins and medals. Most of his works lack simplicity and abound in details. When Cellini was fifty-eight years old, he began to write an autobiography, in which the traits of his character appeared clearly in his vivid pictures of that period of the Renaissance.

Celluloid, *sel'u loid,* an artificial substance extensively used as a substitute for ivory, bone, hard rubber and coral, having a close resemblance to these substances in hardness, elasticity and texture. It is composed of cellulose, or vegetable fibrine, reduced by acids to a substance resembling soluble cotton (See GUNCOTTON); camphor is then added, and the compound is molded by heat and pressure to the desired shape. Celluloid is used chiefly for buttons, handles for knives, forks and umbrellas, billiard balls, backs of brushes, piano keys, napkin rings, opera-glass frames, pipestems, films for cameras and other small articles. It can be variously colored.

Cellulose, *sel'u lose,* the substance which forms the chief part of vegetable cells and is the covering which protects the living protoplasm. Cellulose is not found in the tissues of animals, though large quantities of it are consumed by them. A portion is digested, but in itself it is not an important food product. Cellulose is manufactured in large quantities and is used in making vegetable parchment. Combined with nitric acid, cellulose forms powerful explosives, among which is guncotton. As cellulose swells when wet, it is used for the packing of joints and to prevent leakage in water pipes.

Celts, *selts,* the earliest Aryan settlers in Europe, according to the common theory. They appear to have been driven westward by succeeding waves of Teutons, Slavonians and others. Herodotus mentions them as mixing with the Iberians, who dwelt round the river Ebro, in Spain. At the beginning of the historic period they were the predominant race in Britain, Ireland, France, Belgium, Switzerland, North Italy, Spain and elsewhere. The Romans called them Gauls. They appear to have reached the zenith of their power in the second and third centuries B. C. Some tribes of them, overrunning Greece, settled in a part of Asia Minor, to which the name of Galatia was given. Finally, they fell before the resistless power of Rome and either became absorbed with the conquering races or were confined to the extreme northwest of Europe. At an early date the Celts divided into two great branches, speaking dialects widely differing from each other, but doubtless belonging to the same stock. One of these branches is the Gaelic, represented by the Highlanders of Scotland, the Celtic Irish and the Manx; the other is the Cymric, represented by the Welsh, the inhabitants of Cornwall and those of Brittany. The sun was the principal object of worship among the Celts.

Celts, certain prehistoric weapons or other implements of stone or bronze which have been found over nearly the whole surface of the earth. Stone celts, such as hatchets, adzes and chisels, varying in size from one inch to two feet in length, have been found in vast numbers. The materials of which they are made are flint, chert, clay slate, porphyry, various kinds of greenstone and, in short, any very hard and durable stone. Bronze celts belong to a later period than stone ones and are not so numerous. Some stone celts, however, have been found along with bronze celts, in such a manner as to show that the former were still used when the method of working bronze had been discovered.

Cements, *se ments',* compounds used to stick together other substances. There are many varieties of cement, such as glue, mucilage, paste, mortar and building cements. Building cements are made of certain kinds of limestone containing clay and sand. A small quantity of oxide of lead is added to the mixture. Cements are divided into two classes, *hydraulic* or *water* cements, which will harden under water, and those which will not harden under water.

Portland cement is made by two processes, the wet and the dry. In the wet process the clay and limestone are mixed with a large quantity of water in a mechanical mixer. When it has been thoroughly mixed, it is emptied into large reservoirs and allowed to settle. In time the heavy material or raw cement settles to the bottom. The water is drawn off and the raw cement is left to dry in the air until it is a thick paste. It is then placed in the dry-room, where all the moisture is evaporated, when it is burned in a suitable kiln. The kiln is brought to a white heat, and the cement is kept in it until it is almost glass, or until it is nearly vitrified. It is taken from the kiln in the form of clinkers, which are greenish in color. These clinkers are ground to a fine powder between crushing rolls and packed in bags or barrels ready for shipment. In the dry process the clay and limestone are first separately dried in a dry-kiln, until all the moisture is expelled. The clay and limestone are then mixed and crushed, and the powdered mixture is tempered with water to a stiff paste in a brick-making machine and molded into bricks. The bricks are then burned to the cement clinker in kilns and are finally ground into powder. A natural cement is made from limestone which has the proper ingredients, but it is not as good as the manufactured cement, because the proportions of silica, alumina and iron do not run evenly in the limestone. Cement increases in strength with age and a good cement will attain half of its ultimate strength and hardness within two months. See STONE, ARTIFICIAL.

Cemetery, *sem′e ter y,* (from a Greek word meaning sleeping place), a place of burial. The colonial custom in the United States was to use the churchyards for burial places, and in some of the older cities these yards are still seen around the churches, though burial in them has long since ceased. With the increase of population it became evident for sanitary reasons that burial places should be outside of the towns, and the modern cemetery was established. The oldest cemetery in the United States is Mount Auburn, near Boston, famous for its beautiful walks and drives and as the burial place of many eminent Americans. Laurel Hill in Philadelphia, Greenwood on Long Island, Lakeview at Cleveland, Ohio, containing the Garfield Memorial, and Graceland and Rose Hill in Chicago. are among the great cemeteries of the country, noted for their beauty. There are eighty-three national cemeteries in the United States. These contain the remains of soldiers who were killed or died from disease during the Civil War. These cemeteries are under the supervision of the quartermaster general's office of the war department and are maintained by appropriations made by Congress. The national cemeteries are marked by their simplicity and their beauty. The largest is that at Arlington Heights, near Washington, and contains over 20,000 graves.

Some of the most noted cemeteries in the Old World are the Père Lachaise in Paris, which was the first of modern cemeteries established in western Europe; Kensal Green, Highgate and Abner Park, London, and the West London Cemetery at Brompton. Burial places cannot be located within towns in England. In southern Europe catacombs were formerly used and are still employed to a limited extent. See CATACOMBS; BURIAL.

Cenci, *chen′che,* BEATRICE (1577–1599), an Italian girl, the daughter of Francesco Cenci, a wealthy Roman nobleman. According to an old story, her father treated his family with such brutality that Beatrice, together with her stepmother and brothers, brought about his murder one night at his palace near Naples. Beatrice was imprisoned, with her accomplices, and after a trial was put to death. Shelley's drama, *The Cenci,* is founded upon this story. It is now thought that the beautiful portrait in the Barberini Palace, Rome, known as Guido Reni's *Beatrice Cenci,* is not of Beatrice, nor by Guido Reni.

Cenis, *se nee′*, MONT, a mountain belonging to the Graian Alps, between Savoy and Piedmont, having an altitude of 11,755 feet. It is famous for the winding road, 40 miles in length, constructed by Napoleon I from France to Italy, and for an immense railway tunnel. See CENIS, MONT, TUNNEL OF.

Cenis, MONT, *moN se nee′* or *mont see′nis,* TUNNEL OF, a railway tunnel through the Mont Cenis Pass in the Alps, connecting the Italian province of Turin with Savoy, France. It is eight miles long and has two lines of railway. The cross section is twenty-six feet four inches wide in the broadest part and twenty-four feet seven and one-half inches high. The expense of construction was about $15,000,000. Work was begun in 1857 and the tunnel was completed in 1872. The railway enters the tunnel by means of special curved sections at each end. The construction of this tunnel led to the invention of the power drill and the air compressor, both of which were first used in connection with this work.

Cenozoic, *se′no zo′ik,* **Era,** the latest general division of geologic time, extending from the Mesozoic era to the present. It is usually divided into the Tertiary and Quaternary periods, but some geologists restrict it to the Tertiary, and add the Recent era. See GEOLOGY; MESOZOIC ERA; TERTIARY PERIOD; QUATERNARY PERIOD.

Censer, *sen′sur,* a vase or pan in which incense is burned; a vessel for burning and wafting incense. Among the ancient Jews the censer was used to offer perfumes in sacrifices, that for the tabernacle being of brass, that for the temple, of gold. Censers, called also thuribles, of various forms are still used in the

Roman Catholic Church at mass, vespers and other offices, as well as in some Anglican and other churches. In Shakespeare's time the term was applied to a bottle perforated and ornamented at the top, used for sprinkling perfume, or to a pan for burning any odoriferous substance.

Censors, *sen'sorz,* two officers in ancient Rome, whose business it was to draw up a register of the citizens and the amount of their property, for the purpose of taxation; to keep watch over the morals of the citizens, for which purpose they had power to censure vice and immorality, and to superintend the finance administration and the keeping up of public buildings. The office was the highest in the State, next to the dictatorship, and was invested with a kind of sacred character. The term is now applied to an officer empowered to examine books and, in some countries, articles for the newspapers, before publication.

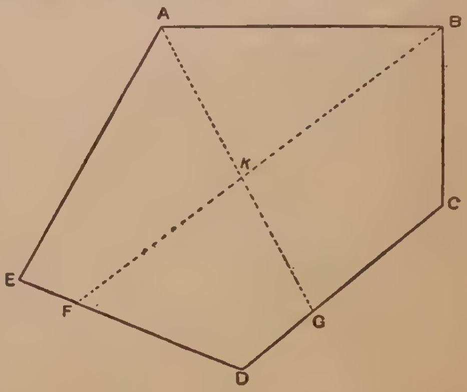
Census, *sen'sus,* with the Romans, a registered, itemized statement of a person's property for taxation purposes. In modern times a census is an enumeration of the inhabitants of a country, accompanied by any other information that may be deemed useful. In the United States, England, Switzerland, Sweden, Norway, Holland, Belgium and Portugal, a census is taken every ten years.

Cent, *sent* (centime), the name of a small coin in various countries, so called because it is equal to a hundredth part of some other coin. In the United States and in Canada the cent is the hundredth part of a dollar. In France the *centime* is the hundredth part of a franc. Similar coins are the *centavo* of Chile and the *centesimo* of Italy and Peru. Cents or centimes, and their equivalents, are written simply as decimal hundredths of the unit of value.

Centaur, *sen'tawr,* in Greek mythology, a fabulous being represented as half man, half horse. The earliest notices of them, however, merely represent them as a race of wild, savage men, inhabiting the mountains and forests of Thessaly.

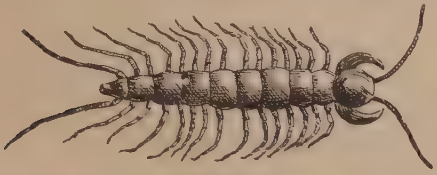
Centennial Exposition, *sen ten'ni al ex'po-zish'un,* an exhibition of arts, manufactures and products, held at Fairmont Park, Philadelphia, in the summer of 1876, to commemorate the one hundredth anniversary of the achievement of independence by the United States. It was the first international exhibition held in America. Its site comprised an area of 236 acres, within which about 200 buildings were erected, the largest of which, the main building, was nearly 2000 feet long and 464 feet wide. Other important buildings were Machinery Hall, Agricultural Hall, Horticultural Hall and Memorial Hall. The last named was constructed of permanent materials and is now used as a museum. Nearly fifty foreign governments were represented in the exhibits, and nearly ten million people were admitted to the grounds, the largest number for a single day being present on Pennsylvania Day (September 28), when 274,919 persons entered the grounds. Special services were held on the opening day, May 10, and on July 4, in honor of the Declaration of Independence. The exhibition was important in that it disclosed to Americans the superiority of some European products, and thus stimulated increased effort for improvement in American goods; and it also opened the eyes of Europeans to the fact that in the New World a manufacturing and commercial nation was developing which threatened European supremacy in those fields.

Center of Grav'ity, that point of a body from which, if the body is suspended, it will balance. The center of gravity may be found by suspending a body so that it will move freely, first from one point, and then from another, and attaching a plumb line at the point of suspension. The point at which the paths made by the plumb line cross is the center of gravity. In the figure, *ABCDE* represents an irregular body. The center of gravity is found by suspending the body from *A* and marking the path of the plumb line, which takes the direction *AG*, then by suspending it from *B* and marking the path taken by the plumb line, *BF*. *K*, the point of intersection, is the center of gravity. The center of gravity of a circular body, such as a ring, is outside the body. See GRAVITATION.



Cen'terville, Iowa, the county-seat of Appanoose co., 90 mi. s. e. of Des Moines, on the Chicago, Rock Island & Pacific, the Chicago, Burlington & Quincy, the Iowa Central and other railroads. It has deposits of coal and limestone, contains packing houses, lumber and flour mills and other factories. There is a public library and a city park. The place was settled in 1847 and incorporated in 1848. Population in 1910, 6936.

Centipede, *sen'ti peed,* an insect-like creature, which has many feet and a body consisting of numerous similar rings or segments, each of which bears a pair of legs. The common centipede, found in the United States, is quite harmless, but some species of tropical countries inflict severe and often dangerous bites. Some of the latter species grow to a length of eighteen inches. They are savage animals and defend themselves energetically.



CENTIPEDE

Cen'tral America, that portion of North America lying between Mexico on the north and Colombia on the south, and containing the states of Guatemala, Honduras, Salvador, Nicaragua and Costa Rica and the colony of British Honduras. Each of these states is described under its title. Central America covers an area of about 181,500 sq. mi. The surface is generally mountainous, having volcanoes as high as 13,000 feet in the north and 11,000 feet in the south, and many high plateaus. The more important rivers are the Usumacinta, Grijalva, Ulna, Escondido, Wanks and San Juan. There are two large lakes, Nicaragua and Managua. The climate is hot and moist along the coast, but it is dry in the high regions. In the regions along the Atlantic there are luxuriant forests, producing mahogany, logwood, palms and tree ferns. Agriculture is the chief pursuit, and the leading products are cocoa, indigo, coffee, India rubber, mahogany and fruits.

The shores of Central America were first seen by Columbus in 1502. The inhabitants were divided into small tribes, who were in constant warfare with one another. In 1524 Pedro de Alvarado, a Spaniard, succeeded in gaining control over most of Guatemala and Salvador. Between 1524 and 1525 Cortez invaded the country and finally overcame the rest of the tribes. In the sixteenth century Central America and Chiapas formed the captain-generalcy of Guatemala until 1821, when Guatemala proclaimed its independence. Two years later the five divisions, corresponding to the five states, constituted themselves into the Republic of the United States of Central America, but in 1839 the union was dissolved. In 1850, Honduras, Salvador and Nicaragua attempted to restore the republic, but were unsuccessful. Because of the frequent political revolutions, the progress of these countries has been much retarded. Through colonization, British Honduras, or Belize, was established in 1850.

Central Falls, R. I., a city in Providence co., 4 mi. n. of Providence, on the Blackstone River and on the New York, New Haven & Hartford railroad. The river supplies good water power, and there are extensive manufactures of cotton, woolen and silk goods, haircloth and machinery. The place was settled in the eighteenth century, but remained a part of Lincoln until its incorporation in 1895. Population in 1910, 22,754.

Centra'lia, Ill., a city in Marion co., 62 mi. e. of Saint Louis, Mo., on the Illinois Central, the Southern and other railroads. It is in a fruit-growing country and has a large trade, especially in apples and strawberries. Coal is mined, and there are railroad shops, flour mills, glass works and other factories. The city has a Carnegie library, a large city hall and several public parks. It owns the waterworks. Population in 1910, 9680.

Centra'lia, Wash., is situated in Lewis co., about 5 mi. from Chehalis and on the Northern Pacific Railroad. The leading industries include sawmills, shingle mills and other wood-working plants. The city has a water system and a fire department. Population in 1910, 7311.

Century Plant. See Agave.

Cephalonia, *chef ah lo'ne ah,* or **Kephalle'nia,** an island of Greece, the largest of the Ionian Islands. It is 30 miles long and has an area of 348 square miles. Population, 83,363.

Cephalopoda, *sef a lop'o dah,* the scientific name of the highest class of mollusks, given them because of the fact that their arms or limbs are arranged in a group about the mouth. Most of them have a head more or less distinct from the rest of the body, and have complicated organs of digestion. In some species the arms are very numerous, while in others there are only a few. See Nautilus; Octopus; Cuttlefish; Squid.

Ceram or **Zeram,** *se rahN′*, an island in the Moluccas, lying w. of New Guinea. It is 115 miles long, 30 miles wide, and has an area of about 7000 square miles. The vegetation is luxuriant, the interior being covered with dense forests of sago palms and cocoa. The inhabitants of the coast are of Malay origin and are known as Alfurus. The island is under Dutch control. Population, probably less than 100,000.

Ceramic, *se ram′ik,* **Art.** See Pottery.

Cereal. See Grains.

Cerberus, *sur′be rus,* in classical mythology, the dog of Pluto, which guarded the entrance to Hades. Some accounts gave it a hundred, and some fifty, heads, but three was the popular number. The dog's tail and mane were snakes.

Cer′ebel′lum, The, that portion of the brain below the posterior lobes of the cerebrum occupying the lower back part of the cranium. The cerebellum weighs about one-eighth as much as the cerebrum, but it is proportionately larger in infants and the lower animals. The white matter of the cerebellum is located on the inside, the gray matter on the outside. The convolutions are very numerous and lie in narrow, transverse folds, separated by numerous deep fissures, placed very closely together; they appear to possess very little of the distinctive character of the fissures and convolutions of the cerebral hemispheres. The surface of the fissures is composed entirely of gray matter, and running toward this from the interior of the cerebellum is the white substance, arranged in a branching manner and called, therefore, Arbor Vitae, or *tree of life.* The functions of the cerebellum are to coördinate and harmonize those muscles used in walking and standing, running, jumping and other voluntary movements. If the cerebellum be removed from a bird's brain, all power to combine the action of the muscles is lost. The bird's movements might be compared to those of a drunken man. See Brain; Cerebrum.

Cer′ebrum, The, the largest portion of the brain. It is divided into lateral and symmetrical hemispheres. The outer surface, composed entirely of gray matter, or *cortex,* is arranged into lobes and convolutions separated by fissures, as shown in the cut under Brain. The cortical layer is composed of alternate strata of gray and white matter, the entire layer being about one-sixth of an inch thick. The true interior of the cerebrum is composed of white matter. There are five great lobes, separated by fissures varying from half an inch to one inch in depth. The lobes are divided into many convolutions by secondary fissures running into those already mentioned. The importance of a study of the convolutions is becoming increasingly obvious, for experimental science has demonstrated that the gray matter found in each convolution presides over some definite function or portion of the body; thus it is a fact not to be questioned that certain convolutions in the frontal lobes control the function of speech; certain others control the motions of the head and extremities on the opposite side of the body. If the cerebrum be removed from a pigeon or rabbit, while it can walk and move about it does so only when stimulated. At other times it remains motionless. The cerebrum may therefore be considered as the originator of voluntary movements. See Brain; Cerebellum; Nervous System; Reflex Action.

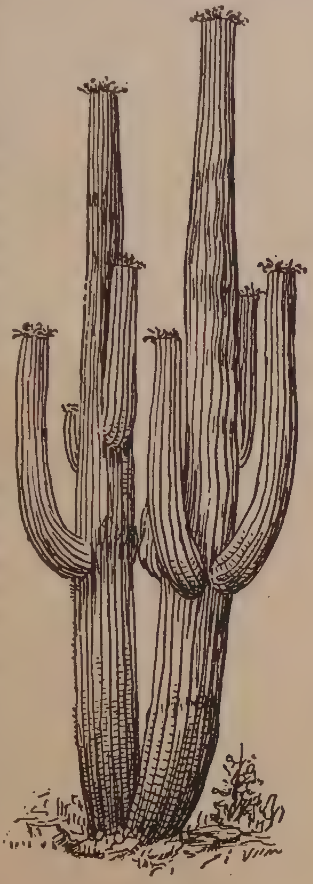
Ceres, *seer′eez,* a Roman goddess, daughter of Saturn and Rhea, and mother of Proserpina or Persephone. She was the goddess of the earth, in its capacity of bringing forth fruits, especially watching over the growth of grain and other plants. When her daughter was stolen and carried off to Hades, Ceres neglected the earth during her search for her daughter, and all vegetation perished. The Romans celebrated in honor of Ceres the festival of the *Cerealia,* and the sacrifices made to her con-

CERES, OR DEMETER

sisted of pigs and cows. Ceres was always represented in full attire, her attribute being ears of corn and poppies. The Greek goddess who corresponded to the Roman Ceres was known as Demeter.

Ceres, the first of the planetoids, discovered on New Year's day, 1801, by Piazzi, at Palermo. See PLANETOID.

Cereus, *se're us,* a large genus of the cactus family, about two hundred species in number, thirty of which are found in the United States. These are tall, tube-like plants, with spiny ribs and large, beautifully shaped flowers. The *night-blooming cereus,* with its large, white, fragrant flowers, is the best known species. The *old man cereus* is so called from the long gray hairs which cover the top of the stem. But more remarkable is the *giant cactus* of Arizona, which, having grown to a height of fifty feet in a naked, leafless column, then crowns each column-like branch with a bunch of great flowers.



GIANT CACTUS

Ce'rium, a metallic element that occurs in many minerals found in Sweden, and a mineral found in North Carolina. Cerium is of a grayish color, is ductile and malleable, and is from five to six times as heavy as water.

Cerro Gordo, *ser'ro gor'do,* BATTLE OF, a battle in the Mexican War, fought April 17 and 18, 1847, between a force of 12,000 Mexicans, under Santa Anna, and an American force of 8500, under General Taylor. The pass of Cerro Gordo had been fortified by Santa Anna, with the exception of one bluff which overlooked his position. Taylor occupied this height and opened fire with heavy guns upon the Mexican fortifications, at the same time making a vigorous attack upon the rear of Santa Anna's position. The Mexicans were soon compelled to flee.

Certiorari, *sur'she o ra're,* WRIT OF. See WRIT

Cervantes Saavedra, *sur van'teez sah a va'drah,* MIGUEL DE (1547–1616), the greatest of Spanish writers, the author of *Don Quixote.* He was born at Alcala de Henarès and removed thence to Madrid at the age of seven. He early commenced writing verses, and his pastoral *Filena* attracted the notice of Cardinal Acquaviva, whom he accompanied to Italy as page. In 1570 he served under Colonna in the war against the Turks and African corsairs, and in the Battle of Lepanto he lost the use of his left hand. After this he joined the troops at Naples, in the service of the Spanish king, winning the highest reputation as a soldier. In 1575, while returning to his country, he was taken by pirates and sold in Algiers as a slave. For five years he remained in captivity, displaying great courage in the face of constant danger of torture; but at length his friends and relations ransomed him and he rejoined his old regiment.

In 1583 he retired from service and recommenced his literary work, publishing in 1584 his pastoral *Galatea.* In the same year he married, and then for a long time he lived by writing for the stage, to which he contributed between twenty and thirty plays, only two of which have survived. From 1588 to 1599 he lived in retirement at Seville, where he held a small office. He did not appear again as an author till 1605, when he produced the first part of *Don Quixote.* This work had as its immediate aim the satirical treatment of the sentimental novels of chivalry, then popular, but it contained such accurate pictures of human types and such a fund of delightful humor that it made its author famous at once. Between 1613 and his death were published his twelve *Exemplary Tales, Journey to Parnassus* and eight new dramas. The second part of *Don Quixote* was also completed during these years.

Cervera y Topete, *ther va'rah e to pa'ta,* DON PASCAL DE (1839–), a Spanish admiral, born in the province of Cadiz. He graduated from the San Fernando Naval Academy and soon after distinguished himself in the campaign against Morocco in 1859. During the Cuban rebellion in 1868 he had charge of the blockade of the coast, but later became secretary of the navy in Spain. Upon the outbreak of the Spanish-American War, he commanded a squadron consisting of four cruisers and three torpedo boats, which was sent to American waters. It entered the harbor at Santiago de Cuba about May 19 and was there blockaded by American vessels under Admiral Sampson. On July 3, under orders, he made a reckless dash for freedom, and in a running engagement all of his vessels were sunk or destroyed and he himself was taken prisoner. On his return to Spain in September of that year he was court-martialed, but was acquitted of blame for the defeat and was liberated July 7, 1899.

Cervin, *sur vaN′*, Mont. See Matterhorn.

Cestus, *ses′tus*, a leathern thong or bandage, often covered with knots and loaded with lead and iron, anciently worn by Roman pugilists to increase the force of the blow. Cestus is also the name of a girdle which was worn by Aphrodite or Venus and which gave the wearer the power of exciting love.

Cetacea, *se ta′she ah*, an order of marine animals, surpassing in size all others in existence. They are true mammals, have warm blood and breathe by means of lungs, for which purpose they come to the surface of the water to take fresh supplies of air. The body is fish-like in form, but ends in a tail which is expanded into horizontal flukes. There are no hind limbs, and the fore limbs are broad paddles, or flippers, enclosed in a continuous sheath of thick skin. The fish-like appearance is further increased by a fin on the back, but this is a simple fold of skin and does not contain bony spines. The right whale and its allies have no teeth in the full-grown state, but, instead, have triangular plates of baleen or whalebone, which are developed on ridges across the palate. The nostrils open directly upward on the top of the head and are closed by valves of skin, which are under the control of the animal. When a cetacean comes to the surface to breathe, it blows the air out violently, and the vapor it contains, becoming condensed into a cloud, resembles a column of water and spray. As a protection against the cold, the animal is covered by a thick coating of blubber underlying the skin. See Whale; Narwhal; Porpoise; dolphin; Sperm Whale.

Cette, *set*, a fortified seaport founded in the seventeenth century, situated on the Mediterranean Sea, 17 mi. s. w. of Montpellier. It is, next to Marseilles, the principal commercial port in the south of France. The town is strongly fortified and has a good harbor, enclosing thirty acres by its piers and breakwaters. A good inland and foreign trade is maintained. The leading industries are shipbuilding, cooperage, the manufacture of chemicals and perfumes, and oyster and anchovy fisheries. The city also has some celebrity as a watering place. Population in 1901, 33,250.

Cevennes, *sa ven′*, a chain of mountains located in the southeast of France, extending from the Pyrenees in the southwest to the Vosges in the northeast, the Côte d'Or being sometimes considered as a part of it, sometimes as a part of the Vosges system. The length of the chain, exclusive of the Côte d'Or, is about 330 miles, the average height not more than 3000 feet. The highest peak is Mézenc, 5753 feet. The Cevennes furnished shelter for the Waldenses, Albigenses and Camisards in their days of persecution.

Ceylon, *se lon′*, an island of the Indian Ocean and a crown colony of Great Britain, about 55 mi. from the southern point of Hindustan, from which it is separated by Palk Strait. It is 267 miles long; its greatest width is 137 miles, and its area is 25,333 square miles. The surface is very mountainous and there are many lofty peaks, the highest of which are Pedrotallagalla, 8264 feet, and Adams Peak, 7420 feet. The soil is fertile and the vegetation is luxuriant, the products being cocoa palm, breadfruit, cinnamon, ebony, bo-tree, cotton, rice, tobacco, pepper, tea, coffee and cinchona, the last three of which are the most important exports of the island. The climate is tropical, but in the high regions it is very pleasant and cool. The mineral resources of Ceylon are considerable, including precious stones—rubies and sapphires—gold, iron and plumbago. There are three harbors, Galle, Colombo and Trincomalee, the last being one of the finest in the world. The railway lines have a length of 297 miles and are for the most part operated by the government. The natives are mostly Singhalese, who speak a modern Indian dialect, an Aryan language. They keep up the ancient customs, habits and costumes of their ancestors (See Races of Men, *color plate*, Fig. 11). There are also many Malabars or Tamils. The Singhalese are Buddhists, while the Tamils are Hindus.

Ceylon since 1831 has been governed by a British governor, assisted by an executive council of five members and a legislative council of seventeen members. There are nine provinces, each under the control of a government agent. The capital is Colombo.

In 543 B. C. the original inhabitants, the Yakkas, were conquered by the Singhalese. In 1200 A. D. the Malabars conquered the country, but later it was partly retaken by the Singhalese. The Portuguese came in 1505 and in 1517 began their settlements. These were reduced by the Dutch in the seventeenth century, and the Dutch were driven out by the British in 1795. Ceylon is one of the most prosperous of British colonies. Population in 1901, 3,576,990.

Chadbourne, *chad'burn,* PAUL ANSEL (1823–1883), an American educator, born at North Berwick, Maine, and educated at Williams College and Hartford Theological Seminary. After completing his education he occupied successively the positions of principal of the high school at Great Falls, professor of chemistry and natural history in Williams College and professor in Bowdoin College. In 1867 he became president of the University of Wisconsin, holding the position for three years. In 1872 he was appointed editor in chief of *The Wealth of the United States* and was chosen president of Williams College in the same year. After occupying this position for nine years, he resigned and became president of the Massachusetts Agricultural College.

Chad'wick, GEORGE WHITFIELD (1854–), an American musician. He received his early musical education in America, but later studied with the best European masters. He returned to America in 1880 to enter the New England Conservatory as instructor, and later became director. Among his important compositions is the oratorio *Judith* and the music for the *Columbian Ode,* sung at the opening of the World's Fair in Chicago

Chaff Cut'ter, an agricultural implement for chopping hay or straw to be used as food for animals. The most common pattern of chaff cutter consists of a series of straight knives, set lengthwise in a wooden or iron shaft, which is attached to a heavy wheel about three feet in diameter. When the shaft revolves, the edges of the knives almost touch the table over which the straw is fed into the machine. By thus pressing down upon the straw the knives cut it into short lengths. The economical advantage of the chaff cutter does not depend on its rendering the chopped food more digestible, but on its permitting it to be more thoroughly mixed with the more nutritive and palatable food, and preventing the animal from rejecting any part of it.

Chaf'fee, ADNA ROMANZA (1842–), an American soldier, born at Orwell, Ohio, and educated in the public schools. He entered the army as a private in 1861, and after the close of the war was brevetted captain in the regular army. He won distinction in the indian service and in the Spanish-American war; commanded the American forces in the Peking campaign of 1900; became a major general in 1901, and was put in command of the army in the Philippines. In 1904 he was appointed chief of staff of the United States Army, and two years later retired, being succeeded by General John C. Bates.

Chaf'finch, a beautiful European finch, very common in England, where its haunts are chiefly gardens and shrubberies, hedgerows and plantations. The male, which is six or seven inches in length, has a chestnut back, reddish-pink breast and throat and a yellowish-white bar around the wings. The chaffinch feeds on seeds, insects and their larvae. It has a strong voice that in the wild state is not pleasant, but it can be taught to sing very beautifully and almost to articulate words. Several efforts have been made to introduce the chaffinch in the United States, but without great success.

Chagres, *chah'gras,* a seaport of Panama, on the north coast of the Isthmus of Panama, at the mouth of the Chagres River. It is destined to be one of the outlets of the Panama canal, when that long-delayed project is completed. Population, about 1000.

Chain, a line made of links of metal. The metal used is iron, steel, brass or bronze, or, if the chain is for ornamental purposes, gold or silver. Small iron chains are made by winding the wire, when cold, into a spiral, then cutting off each coil with shears. The separate coils form the links of the chain, which are then welded together. In making large chains the iron is cut into bars, each long enough for a link. These are then shaped and welded by hand. Some steel chains, however, are made by machine. The steel is rolled into bars especially for the purpose. and the machine cuts away the metal so as to leave the links, much as a boy would cut away the wood in making a wooden chain. Machine-made chains are lighter and stronger than those made by hand, and a small chain is proportionately stronger than a large one, because small wire has proportionately greater strength than large wire. Chains are used in some instances in place of ropes, for conveying power in machinery and for numerous other purposes.

Chain, in surveying, a unit of measure consisting of 100 *links*, each 7.92 inches in length, having a total length of 4 rods, or 66 feet. 100,000 square links make 1 acre. It is often called *Gunter's chain*, from its inventor, Edmund Gunter.

Chain Pump, a pump consisting of an endless chain equipped with a number of valves in the form of small cylinders and moving round two wheels, one above and one below. The chain in its ascent passes through a tube closely fitting the valves. By this means the water is raised and delivered through a spout, at the side of the tube or over the top. Chain pumps are used for raising water from deep wells and do not depend upon the pressure of air for their action, as does the common pump.

Chain Shot, two cannon balls connected by a chain, which, when discharged, revolve upon their shorter axis. Such shot are used at sea to cut down masts and rigging.

Chaise, *shaze*, the name originally given to a two-wheeled, one-horse vehicle with a top. The body was hung on straps. The name was afterwards applied to light, open, four-wheeled carriages of various constructions. The original chaise has been immortalized by Oliver Wendell Holmes in his poem, *The Wonderful One-Hoss Shay*.

Chalcedon, *kal see′don*, an ancient town of Bithynia in Asia Minor, on the Bosporus, opposite Byzantium. Chalcedon was founded by Grecian colonists about 685 B. C. It was the seat of the fourth general council of the Christian Church. This council, convoked by Emperor Marcianus in 451 A. D., was attended by over six hundred bishops, the legates of Pope Leo I and the commissioners of the emperor. It condemned the Robber Council of Ephesus (See EPHESUS, COUNCIL OF) and adopted an orthodox confession of faith.

Chalcedony, *kal sed′o ny*, a variety of quartz, called also white agate, resembling milk diluted with water, semi-transparent or translucent, and more or less clouded with circles and spots. When found in cavities of rocks it is usually uncrystallized. It sometimes occurs in veins in rocks and in rounded, grape-like masses. There are several varieties, such as the common chalcedony, agate, chrysoprase, sard, carnelian and sardonyx, each of which is described under its title.

Chalcis, *kal′sis*, a Greek town, capital of Euboea, separated by the narrow strait of Euripus from the Boeotian coast, on the mainland of Greece. Chalcis early became one of the greatest of the Ionic cit es, carrying on an extensive commerce and planting numerous colonies in Syria, Macedonia, Italy, Sicily and the islands of the Aegean Sea. It was subsequently a place of importance under the Romans. There is still a town on the site, consisting of an inner walled town and an outer suburb, and said to be one of the prettiest and most attractive of Greek provincial towns. A bridge, so constructed as to let vessels pass through, connects it with the mainland. Population, about 8000.

Chaldea, *kal de′ah*, a district southeast of Babylonia, on the Persian Gulf. Little is known of its history, except that its inhabitants were a warlike people who preserved their independence at all times. At various periods in the early history of Babylonia, Chaldean, princes sat on the throne, but it was toward the end of the seventh century B. C., after the Chaldean, Nabopolassar, overthrew the Assyrian rule and founded the New Babylonian kingdom, that Chaldea became supreme in Mesopotamia. Nabopolassar's son Nebuchadnezzar was the greatest of this dynasty, which closed 556 B. C. Hebrew and classical writers, not only of this period but of later times, use the names Babylonian and Chaldean synonymously. See BABYLON; BABYLONIA.

Chaldee, *kal′de*, **Language,** a name often given to the Aramean language, one of the principal varieties of the ancient Semitic. Chaldee literature is usually arranged in two divisions: the Biblical Chaldee, or those portions of the Old Testament which are written in Chaldee, namely, certain chapters in *Daniel*, *Ezra* and *Jeremiah*; and the Chaldee of the *Targums* and other later Jewish writings. Chaldee was presumably the language of Abraham before his migration to Palestine. See ARAMAIC.

Chaleurs, *sha lur′*, **Bay,** an inlet of the Gulf of Saint Lawrence, which partially separates New Brunswick from the Province of Quebec. Its length from east to west is 185 miles, and its greatest width is 20 miles. This inlet was discovered and named by Jacques Cartier in 1535. The water is deep, and the bay affords good anchorage for sea-going vessels. The shores are sparsely settled.

Chalice, *chal′is*, the name originally given to any drinking cup, but now used to designate especially the vessels that hold the wine in the holy sacrament. The earliest chalices were made of wood or horn; later ones were of glass and crystal, and in the Middle Ages gold, silver and other precious metals were used. Many of them were adorned with most elaborate designs in enamels and precious stones. The shapes have varied as much as the style of ornamentation.

Chalk, *chawk*, a variety of limestone formed almost wholly of the shells of minute marine animals, known as *foraminifera* (See FORAMINIFERA). Chalk is usually white or gray, coarse-grained and so soft that it cannot be polished. Impurities, however, sometimes give it other colors. It is found in large quantities in various parts of the world. It forms the white cliffs that border the English channel and to whose color England owes its ancient name of *Albion*. In the United States large quantities are found in Arkansas, Iowa, Montana, Texas and some other states. The Texas belt is over 250 miles in extent and is nowhere less than 600 feet thick. Chalk is used in the manufacture of cement, for making lime for whitewash and for marking on blackboards; but when used for the last-named purpose it is generally ground and pressed into sticks called *crayons*. See CRETACEOUS SYSTEM.

Chal'lenger Expedition. In 1872 the British government sent the *Challenger*, a corvet of a little more than two thousand tons burden, on a long trip around the world, for the purpose of sounding the depths of the ocean, mapping the basins and studying the life of the Atlantic, Southern and Pacific oceans. The *Challenger* spent nearly four years on this expedition and traveled nearly 70,000 nautical miles; it made investigations at 362 stations, making the deepest soundings in March, 1875, at 4575 fathoms. See FISHES, DEEP SEA.

Chal'mers, THOMAS (1780–1847), a Scotch theologian and reformer, born in Anstruther and educated at the University of Saint Andrews. He fitted himself to be a preacher, and on completing his education he was ordained to the ministry, but for a number of years following, though pastor of a church, he gave most of his attention to the study of political economy and doctrinal theology. During this time he wrote the article on Christianity for the *Edinburgh Encyclopedia*. In 1815 he was established in the Tron church and parish, Glasgow. Chalmers was an orator of no mean ability, and his preaching soon attracted wide attention He became interested in the wretched condition of his parishioners, most of whom were mill hands, and from that time devoted much of his energy to the establishment of such reforms as would enable these people to better their social, moral and religious conditions. He is credited with establishing the first social settlement in the world, and although his enterprise was abandoned after some years, his plan has since been adopted and followed in many large cities of England, the United States and other countries. After occupying his position in Glasgow for thirteen years, he was chosen professor of theology in the University of Edinburgh, and a few years later he became involved in the controversy concerning matters of administration, which resulted in the division of the Presbyterian Church. In 1843 Chalmers and about 500 other clergymen left the old Church and established the Free Church. He was recognized as the leader of this movement, and the stable foundation upon which it was placed in the next few years was due very largely to his wisdom and efforts.

Châlons-sur-Marne, *sha loN'sur mahrn'*, a city of France, capital of the Department of Marne, 90 mi. e. of Paris. Chalons is an important center of the champagne trade and has manufactures of woolen and cotton goods and shoes. In 451 Attila was defeated before the walls of Chalons by the Romans and their allies, the Visigoths, and from the tenth century it flourished as an independent state under count-bishops until it was united with the crown in 1360. A celebrated camp, established by Napoleon III about 18 miles from Chalons for the purpose of training the French troops, is still to some extent employed. Population, 21,490.

Chalybeate, *ka lib'e at*, **Waters,** waters holding iron in solution, either as a carbonate or as a sulphate, with or without other salts. All waters containing iron are distinguished by their puckery, inky taste, and by the more or less deep color produced by an infusion of tea or of nutgalls. Chalybeate springs are found in various parts of Europe and the United States, and their waters are used medicinally. Among the most noted are those at Tunbridge Wells and Vicarsbridge, England, and Bailey's Springs, Alabama, and Alum Springs, Virginia, in the United States.

Chalybite, *kal'i bite*. See SIDERITE.

Chamberlain, *chame'bur lin*, JOSEPH (1836–), an English statesman, born in London and educated at London University School. He became a member of a firm of screwmakers at Birmingham, but gave up active connection with the business in 1874. He early became prominent in Birmingham, both in connection with civic and political affairs, was chairman of the school board and thrice in succession was mayor of the city. In 1876 he entered Parliament as a representative of Birmingham, and under Gladstone's premiership he became president of the board of trade and a cabinet minister. In the Gladstone government in 1886 he was president of the local government board; but his leader's Irish policy caused him to resign, and from that time, as member for West Birmingham, he was one of the most pronounced members of the Liberal Unionist party. He was in America in 1887 as one of the British representatives appointed to negotiate a settlement of the fishery disputes between Canada and the United States, and in the Marquis of Salisbury's cabinet he became colonial secretary. Chamberlain had much to do with the events which led up to the South African War, and he visited the Transvaal after the close of the struggle. The plan which he proposed in 1903 of imposing a tariff on imports from all countries except British colonies entailed a complete change in the financial policy of Great Britain, but it proved acceptable neither to Parliament, to the English people nor to the colonies.

Chamber of Commerce. See COMMERCE, CHAMBER OF.

Chambers, *chame'burz,* EPHRAIM (1680–1740), a miscellaneous writer, the compiler of the popular *Cyclopaedia, or a Universal Dictionary of Arts and Sciences.* During his apprenticeship to a mathematical instrument- and globe-maker in London he formed the design of compiling this *Cyclopaedia,* and even wrote some of the articles for it behind his master's counter. The first edition was published in 1728. Several subsequent editions appeared previous to his death in 1740, and it was the basis of the cyclopaedia of Dr. Abraham Rees.

Chambers, ROBERT (1802–1871), an historical and miscellaneous writer, the younger of two brothers originally composing the publishing firm of W. & R. Chambers. He received his education at the Peebles parish school and in the high school of Edinburgh. When his family met with a reverse of fortune, he got together all the books belonging to his mother and himself, and at sixteen years of age commenced business as a bookseller in Edinburgh. He edited *Scottish Ballads and Songs* and a *Biographical Dictionary of Eminent Scotsmen,* and with his brother he commenced *Chambers's Edinburgh Journal,* which achieved an immense success. From this time the brothers united in the publishing business and issued a series of works for popular entertainment and instruction. Robert Chambers's great work is *Vestiges of the Natural History of Creation,* an exposition of the growth and history of the natural world.

Chambers, WILLIAM (1800–1883), a Scotch writer and publisher, brother of Robert Chambers (See CHAMBERS, ROBERT). He was twice lord provost of Edinburgh, and latterly bore the expense of restoring the old Church of Saint Giles, Edinburgh. He also presented the town of Peebles with an institution embracing a library, reading room and museum. Besides the articles for the *Edinburgh Journal* and those in which he united with his brother, William Chambers wrote *Things as They Are in America, Ailie Gilroy* and other works.

Chambersburg, *chame'burz burg,* PA, the county-seat of Franklin co., about 50 mi. s w. of Harrisburg, on the Conococheaque Creek and on the Cumberland Valley, the Western Maryland, the Philadelphia & Reading and other railroads. It has an academy, a fine courthouse and a number of handsome churches. There are railroad shops and manufactures of shoes, hosiery, flour, furniture, engines and other articles. The place was settled by Benjamin Chambers in 1730 and was first known as Falling Spring; it was incorporated in 1803. Population in 1910, 11,800.

Chambly, *shahN'ble,* a town in Chambly co., Quebec, Canada, situated at the foot of rapids in the Richelieu, or Sorel, River, about 25 mi. s. e. of Montreal. The place is of historical interest as the site of a British fort which was captured by the Americans under Major Brown during Montgomery's invasion of Canada, in 1775. The capture of this fort led to the surrender of the British garrison in the fort at Saint Johns, 12 miles farther south. By this surrender a large quantity of provisions and military stores fell into the hands of the Americans, also the colors of the 7th British regulars. These were sent to the Continental Congress and constituted the first trophy of the kind received by them.

Chambord, *shahN bor',* a castle, park and village, near Blois, in the Department of Loir-et-Cher, in France. The splendid castle, in the Renaissance style, was mainly built by Francis I. In 1745 it was given by Louis XV to Marshal

Saxe, who died there in 1750. Napoleon gave it to Berthier, and in 1821 a company of Legitimists bought it and gave it to the duke of Bordeaux in the name of the people of France.

Chambord, Henri Charles Ferdinand Marie Dieudonne, Comte de, and Duc de Bordeaux (1820–1883), the last representative of the elder branch of the French Bourbon dynasty, called by his partisans Henry V of France. He was born after the assassination of his father, Prince Charles Ferdinand d'Artois, duc de Berry. Charles X, after the revolutionary outbreak of 1830, abdicated in his favor; but the young count was compelled to leave the country with the royal title unrecognized by the nation. While abstaining from violent attempts to seize the crown, he let slip no opportunity of urging his claims, especially after the French defeat at Sedan; but his belief in divine right, his devotion to the see of Rome and his failure to recognize modern tendencies destroyed all chance of his succession.

Chameleon, *ka me'le un,* a genus of lizards, native of parts of Asia, Africa and the south of Europe. The best-known species has a naked body six or seven inches long, and feet and tail all suitable for grasping branches. The skin is cold to the touch and contains small grains which in the shade are of a bluish-gray color, but which in the light of the sun become a grayish-brown or tawny color. The chameleon possesses the curious power, however, of changing its color, either in accordance with its surroundings or with its temper, when disturbed. Its power of fasting and habit of inflating itself gave rise to the fable that it lived on air, but in reality it feeds upon insects, taking its prey by rapid movements of a long, sticky tongue. In general habit chameleons are dull and sluggish. In the southern United States and the West Indies the chameleons, which there are often called scorpions, are smaller than in Africa, and are usually a light emerald green above and white below. They are often kept as pets.

Chaminade, *shah me nahd',* Cecile Louise Stephanie (1861–), a French composer and pianiste. At eight years of age she had composed sacred music of considerable merit, and after several years of study under eminent teachers she made a successful début in 1879. Thereafter she appeared frequently in concert, but devoted herself especially to composition, many of her works being excellent examples of the best modern music. Probably her best-known instrumental composition is the *Scarf Dance,* but her fame chiefly rests upon her songs, whose quaint melodies and charming accompaniments have made them popular throughout the world. The most important are *Berceuse, Rosamonde* and *The Silver Ring.*

Chamois, *sham'my,* a goat-like antelope, living in the high mountains of Europe and western Asia. It is a rather small animal, with a brownish coat that changes to faun color in summer and gray in the spring. Its head is of a pale yellow color, marked by a black band surrounding the eyes and extending from the nose to the ears. Its horns, which are about six or seven inches long, are round and almost smooth, and they grow straight upward until near the tip, where they suddenly end in a sharp hook that is bent backward. The tail is black. During the feeding time, which is in the morning, one animal is always standing on guard in some prominent place, for the purpose of warning the rest of approaching danger. The great agility of the chamois, the roughness of the mountains which it inhabits, and its powers of smell, make its pursuit both difficult and dangerous. Though the flesh is highly prized as food, the chief value of a chamois lies in its skin, which is used to make the very soft flexible leather known as "shammy skin."

CHAMOIS

Chamomile or **Camomile,** *kam'o mile,* a well-known plant belonging to the natural order Compositae. It is perennial and has slender, trailing, hairy, branched stems. The flower is white, with a yellow center. Both leaves and flowers are bitter and aromatic. The fragrance is due to the presence of an oil, of a light blue color when first extracted. Both the leaves and the flowers are employed in fomentations and poultices, and also in the form of an infusion. It is cultivated in gardens in the United States and is also found wild, especially in the form of the common troublesome *mayweed.*

Chamouni, *shah moo ne',* or **Chamonix,** *shah-mo ne',* a valley in France, in the department of Haute-Savoie, in the Pennine Alps, 3000 feet above sea level. The mountains on the east side are always snow-clad, and from these proceed numerous glaciers, such as the Glacier des Bossons and the Mer de Glace. The village of

Chamouni is much frequented by tourists, and is one of the points from which they visit Mont Blanc.

Champagne, *sham pane′*, a French wine, white or red, which is made chiefly in the Department of Marne, in the former province Champagne, and is generally characterized by its property of frothing, or effervescing, when poured from the bottle, though there are also *still* Champagne wines. The creaming or slightly sparkling Champagne wines are more highly valued and fetch greater prices than the full-frothing wines, in which the small quantity of alcohol they contain escapes from the froth as it rises to the surface, carrying with it the aroma and leaving the liquor nearly tasteless. The property of creaming, or frothing, possessed by these wines is due to the fact that they are partly fermented in the bottle, carbonic acid being thereby produced. Wine of a similar kind can of course be made elsewhere, and some of the German champagnes are hardly to be distinguished from the French. Much artificial or imitation champagne is sold, and an excellent wine of similar nature is made in California. See Wine.

Champaign, *sham pane′*, Ill., a city of Champaign co., 128 mi. s. by w. of Chicago, on the Illinois Central, Big Four and Wabash railroads. It is the twin town of Urbana. It is located in an agricultural and mineral region and has railroad shops and foundries. Population in 1910, 12,421.

Champ de Mars, *shoN de mahrs′* (Field of Mars), an extensive piece of ground in Paris, used as a place of military exercise. This was the place where Louis XVI swore to defend the new constitution in 1790, and it was the site of the exhibitions of 1867, 1878 and 1889.

Champlain, *sham plane′*, **Lake,** a lake lying between New York and Vermont, but having its northern end in Canada. It is 125 miles long and from one-half to 15 miles wide. It is connected by canal with the Hudson River and has for its outlet the Richelieu, or Sorel, River, flowing north to the Saint Lawrence. Numerous small streams flow into the lake, and it contains a number of islands. The scenery is beautiful and attracts many visitors.

Champlain, Samuel (1567–1635), a French explorer, born at Bronage. His exploits in the maritime war against Spain in 1595 attracted the attention of Henry IV, who commissioned him in 1603 to found settlements in North America. After three voyages for that purpose, in the last of which he founded Quebec (1607), he was in 1620 appointed governor of Canada. During the following years he conducted affairs with ability, doing much to extend French influence and civilization throughout America. His alliance with the Algonquin against the Iroquois was a determining influence in American history.

Champollion, *shahN po lyoN′*. Jean François (1790–1832), a French scientist. He went to Paris, where, with the aid of the Rosetta Stone and the suggestions thrown out by Dr. Thomas Young, he discovered the key to the hieroglyphics of the Egyptians. In 1826 Charles X appointed him to superintend the department of Egyptian antiquities in the Louvre, and he went as director of a scientific expedition to Egypt. On his return the chair of Egyptian archaeology was founded for him at the College of France.

Champs Elysees, *shahN′za le za′*, a famous promenade of Paris, extending from the Place de la Concorde to the Place de l'Etoile, about 1¼ miles. In 1616 it was laid out by Marie de' Medicis. The avenue is lined with beautiful trees and buildings. See Paris, subhead *Parks and Boulevards.*

Chancel, *chan′sel*, a term almost synonymous with *choir* and designating the end of the church opposite the entrance, properly containing the choir and the sanctuary, the latter term being used to denote the place where the altar or communion table was placed. It was occupied by the clergy and the singers and was divided from the rest of the church by a screen or rail, which in the English, medieval, Russian and Greek churches entirely shut it off from the spectators. In the Gothic churches the chancel corresponded to the apse of the ancient basilicas. See Apse; Basilica.

Chan′cellorsville, Battle of, a famous battle of the Civil War, fought May 1 to 4, 1863, between a Federal army of 100,000, under General Joseph Hooker, and a Confederate force of 90,000, under General Lee. The latter were entrenched on the west side of the Rappahannock River. Hooker planned to attack this position on both flanks and dispatched Sedgwick to turn the enemy's right wing, while he himself with another force crossed the river and prepared to attack the left end of the line. The movement was at first successful, and Hooker had occupied Chancellorsville with 45,000 troops before Lee discovered the movement. The latter immediately began an attack, however, and on May 2 "Stonewall" Jackson, with 20,000 Confederates, completely destroyed a Federal corps under General Howard. In this engagement "Stonewall" Jackson was fired upon by mistake by his own troops and was mortally wounded. On the following day the Confederate assault was even more successful, the Federals being completely demoralized and compelled to retreat.

Chancery, *chan'sur y.* See COURTS; EQUITY.

Chand'ler, WILLIAM EATON (1835–), an American statesman, born in Concord, N. H. He graduated at Harvard law school in 1855, and in 1862 he was elected to the state legislature, becoming speaker. From 1865 to 1869 he served as assistant secretary of the treasury, and from 1882 to 1885 as secretary of the navy. In 1887 he was elected to fill a vacancy in the United States Senate, and was reëlected until 1901. In that year he was appointed president of the Spanish Treaty Claims Commission.

Chandler, ZACHARIAH (1813–1879), an American satesman and merchant, born at Bedford, N. H. He removed to Detroit in 1833, became a prominent Whig and in 1851 was elected mayor of the city. He assisted in organizing the Republican party and in 1857 was elected United States senator, being reëlected in 1863 and 1869. In 1874 he was made secretary of the interior by Grant, which post he held until March 1, 1877. In 1876 he was chairman of the Republican national committee and was reëlected to the Senate in February, 1879. There he gained notoriety by an immoderate attack upon Jefferson Davis.

Chang-Chow', a walled city of China, in the province of Fu-kien, 24 m. w. by n. of Amoy, which is its port. It stands in a valley surrounded by hills and intersected by a river. The streets are broad, paved with granite in the business section and lined with good modern buildings. The most interesting building is a Buddhist temple, built in the eighth century. The important industries are the manufacture of silk goods, sugar and bricks. The city has an extensive trade in tea and sugar. Population, estimated from 800,000 to 1,000,000.

Chan'nel Islands, a group of islands in the English Channel, off the west coast of Department La Manche, in France, consisting of Jersey, Guernsey, Alderney and Sark, with some dependent islets. Their combined area is 75 square miles. They have a mild climate and a fertile soil, which yields early vegetables and fruits for the London market; and each large island has a breed of noted cattle used for dairy purposes. Granite from Jersey and Guernsey is exported for building purposes. These islands belong to Great Britain, and on account of their strategic importance they have been strongly fortified. They are the only remains of the Norman provinces once subject to England. Population in 1901, 95,800.

Channing, *chan'ing,* WILLIAM ELLERY (1780–1842), a famous American preacher and writer, born at Newport, Rhode Island. He studied at Harvard College, became a decided Unitarian and taught Unitarian doctrines with great zeal and success. His first appointment as a pastor was in 1803, when he obtained the charge of a congregation in Boston. He soon became known as one of the most popular preachers of America. His reputation was still further increased by the publication of writings, chiefly sermons and reviews on popular subjects. Coleridge said of him, "He has the love of wisdom and the wisdom of love."

Chantilly, *shahN te ye',* a town in France, Department of the Oise, 25 mi. n. n. e. of Paris. It is celebrated for a variety of lace made here and in the neighborhood; for the splendid chateau, built by the great Condé, but destroyed by the mob during the Revolution, and also for another palace built by the duc d' Aumale after the estate came into his possession in 1850, which, along with the fine domain, was presented by the duke to the French Institute in 1887. It is also noted for the horse races held there. Population in 1901, 4690.

Chan'trey, SIR FRANCIS (1781–1841), a noted English sculptor, born near Sheffield, the son of a well-to-do carpenter. In 1802 he commenced work for himself at Sheffield, by making portraits in crayons. After studying at the Royal Academy, he eventually settled in London, where he presented numerous busts at the exhibitions of the Royal Academy. Among his celebrated works are the *Sleeping Children,* in Lichfield cathedral; the bronze statue of William Pitt, in Hanover Square, London; one of George III, and one of Washington, in the state house, Boston. His full-length figures betray an insufficient acquaintance with anatomy, and several of his equestrian statues are still more defective.

Chanute, *cha noot',* KANS., a city in Neosho co., 125 mi. s. w. of Kansas City on the Atchison, Topeka & Santa Fé and the Missouri, Kansas & Texas railroads. It is in an oil and natural gas region and is growing very rapidly, having more than doubled in population in less than four years. Here are railroad shops and a number of other manufactures. The place was settled in 1872 and was incorporated in the next year. Population in 1900, 4208, and in 1910, 9272.

Chapala, *chah pah'la,* a picturesque lake of Mexico, situated in the states of Xalisco and Michoacan, 200 mi. n. w. of the City of Mexico. It has an area of 1400 square miles and is the largest lake in Mexico.

Chapleau, *sha plo',* SIR JOSEPH ADOLPHE (1840–1898), a Canadian statesman, born in Quebec. He was chosen to the provincial legislature and in 1873 became solicitor general of the province. He rose rapidly, becoming successively provincial secretary, premier of Quebec, minister of agriculture and, finally, in 1882, secretary of state for Canada. Later he was appointed lieutenant governor of Quebec. He was a strong conservative and was considered the leading French-Canadian orator of the time.

Chap'man, GEORGE (1557–1634), an English poet, the earliest and perhaps the best translator of Homer. The *Iliad* was published in installments from 1598 to 1611; the *Odyssey* appeared in 1614–1615. These translations have been highly commended by such poets as Pope, Keats and Coleridge, and by Lamb, but they have also been criticised somewhat on the score of inaccuracy. Keats's sonnet, *On First Looking into Chapman's Homer,* is well known.

Chapul'tepec, BATTLE OF, a battle of the Mexican War, fought September 12 to 14, 1847, between 7000 Americans, under General Scott, and a Mexican force of 25,000, under General Santa Anna. The Americans under Pillow made a vigorous attack upon the castle, which was captured after a brief but stubborn fight, together with a force of nearly 1000 Mexicans. General Worth a little later captured the main fortress of the city, but the battle raged in the streets for many hours, the Mexicans finally withdrawing.

Charade, *sha rade',* a kind of riddle, the subject of which is a word composed of several syllables, each of which can be taken as a separate word. Each syllable, considered as a separate word, is either described or dramatically represented, and finally the whole word is given a sort of enigmatic definition. The following is an example: "Some one threw my first and second at me, and it hit my third. It did not hurt me, for it was only a branch of my whole." Answer, *Mistletoe.* When dramatic representation is used to indicate the meaning of the syllables and the whole word, it is called an acting charade.

Char'coal, a variety of coal obtained by burning wood and bones with a limited supply of air. Lampblack and coke are also varieties of charcoal. Wood charcoal is prepared by piling billets of wood in a pyramid form and causing them to burn slowly under a covering of earth, or in a closed kiln. In consequence of the heat, part of the combustible substance is consumed, part is volatilized, together with a portion of water, and there remains behind the carbon of the wood, retaining the form of the tissue. Wood charcoal, well prepared, is of a deep black color, brittle and porous, tasteless and inodorous. It is infusible in any heat a furnace can raise; but by the intense heat of a powerful galvanic apparatus it is hardened and at length is volatilized, presenting a surface with a distinct appearance of having undergone fusion. Charcoal is insoluble in water and is not affected by it at low temperatures; hence, wooden stakes which are to be immersed in water are often charred to preserve them, and the ends of posts stuck in the ground are also thus treated. Owing to its peculiarly porous texture, charcoal possesses the property of absorbing a large quantity of air or other gases at common temperatures and of yielding the greater part of them when heated. Charcoal likewise absorbs the odoriferous and coloring principles of most animal and vegetable substances, and hence it is a valuable deodorizer and disinfectant. It is used as fuel in various arts, where a strong heat is required without smoke, and in various metallurgic operations, especially in the manufacture of blister steel (See STEEL). It is used in the manufacture of gunpowder. In the form of ivory black and lampblack, it is the basis of black paint; and mixed with fat oils and resinous matter, to give a due consistency, it forms printing ink. See BONEBLACK; LAMPBLACK.

Charcot, *shahr ko',* JEAN MARTIN (1825–1893), a French physician, celebrated for his work upon diseases of the nervous system. He embodied the results of his discoveries in many important publications on nervous diseases and their treatment, and established the use of hypnotic suggestion in the treatment of hysteria and other nervous diseases. See HYPNOTISM.

Charente, *sha rahNt',* a river in western France, rising in the Department of Haute-Vienne and, after a course of more than 200 miles, falling into the Bay of Biscay, about 8 miles below Rochefort, opposite the isle of Oléron.

Charing, *chair′ing,* **Cross,** a district of London, so named from a cross which stood, until 1647, at the village of Charing, in memory of Eleanor, wife of Edward I. It is now a triangular piece of roadway at Trafalgar Square and is occupied by an equestrian statue of Charles I.

Char′iot, an ancient two-wheeled vehicle used in war or in processions of state. The common form of the ancient chariot was that of a vehicle on low wheels, open behind and at the top, the sides and front being about four feet in height. Chariots were used by the Egyptians, Assyrians, Greeks and Romans. They were strongly and often elegantly built, but were not well suited to speed. Among the ancient nations chariots were of great importance in war. There are a number of sculptures which give a clear idea of the Assyrian chariots. These resemble the Egyptian in all essential features, containing almost invariably three men—the warrior, the shield-bearer and the charioteer. A peculiarity of both is the quiver or quivers full of arrows, attached to the side. From the front of the chariot a singular ornamental appendage stretches forward. War chariots had sometimes scythe-like weapons attached to each extremity of the axle, as among the ancient Persians and Britons. Among the Greeks and Romans chariot races were common.

Charity, Sisters of (also known as Sisters of Mercy), the name given to a number of orders of women in the Roman Catholic Church. The first organization was established in France by Saint Vincent de Paul in 1629. The order was approved by the pope, and it spread rapidly. The members are forbidden to marry, and they devote their lives to the care of the sick and the destitute and to the protection of homeless children and the aged. The order has spread wherever the Catholic Church is found, and is one of the strongest, most widely known and generally appreciated organizations within that Church. Because of their self-sacrificing lives and their systematic devotion to assisting the needy, these orders have been spared persecution many times during religious conflicts, and they have been saved by opposing forces when cities in which they were established were besieged and nearly destroyed. There are a number of orders in America which are popularly known as Sisters of Charity. One of these was founded in Maryland in 1809, under a distinct rule, and has a number of houses in the United States.

Charlemagne, *shahr′le mane,* or **Charles the Great** (742–814), king of the Franks and first of the Holy Roman emperors, the son of Pippin the Short and the grandson of Charles Martel. With his brother Carloman he succeeded his father, and on the death of Carloman the free vote of the Franks made Charlemagne sole king. His reign of forty-six years was filled with wars and conquests, as during that time he undertook fifty-two campaigns, the chief of which were against the Lombards, the Saracens and the Saxons. When Desiderius, king of the Lombards, sought to obtain the succession for the children of Carloman, Charlemagne marched against him, seized all his possessions and placed on his own head the famous "Iron Crown of Lombardy" (774). Before leaving Italy he visited Rome and confirmed the donation made by his father to the pope, of certain portions of Lombardy. This was the beginning of the papal claims to temporal supremacy. In 777 Charlemagne made an expedition against the Saracens in Spain. He was victorious, but on the return march across the Pyrenees, the rear of his army was attacked by the Gascons and Basques, wild mountaineers of that region, and cut to pieces in the famous Pass of Roncesvalles.

Charlemagne's most frequent and important campaigns were against the Saxons, one of the few pagan German tribes at this time. He was determined to establish Christianity among them at any cost, but for more than thirty years they resisted him. During this struggle, after one of the innumerable revolts, Charlemagne had forty-five hundred Saxon prisoners put to death at one time. The Saxons at last yielded, and most of the leaders were baptized.

In the year 800 Charlemagne was called to Rome by Pope Leo III to aid him against a hostile faction. The king speedily punished the pope's enemies, and before leaving Rome was rewarded for his services. During the festivities in the Cathedral of Saint Peter on Christmas Day, Pope Leo approached the kneeling king, placed on his head a crown of gold and proclaimed him emperor of the Romans, the consecrated successor of Caesar Augustus and Constantine.

Charlemagne is famed as a statesman and a patron of learning. Under his rule commerce was protected, and robbers who preyed upon traveling merchants were severely dealt with; agriculture was encouraged and improvements were taught to the farmers, the emperor's own estates being a praiseworthy model. Charlemagne formed at his court a school for the nobles and their sons, and he himself learned to read Latin and even Greek, although he could not write legibly. He was married four times, and left one son, who became Louis I, surnamed *The Pious*. Charlemagne's empire, at his death, extended from the Baltic to the Mediterranean, from the Atlantic Ocean to the Danube, thus including modern France, Germany, Holland, Belgium, Switzerland, Hungary, a little of Spain and most of Italy. His capital was at Aix-la-Chapelle. After his death it was harassed by the Northmen and by internal dissension, until finally, by the Treaty of Verdun in 843, it was divided among his three grandsons, Charles, Lothair and Louis, the divisions made laying the foundations, subject to some territorial changes, of the modern nations, France, Italy and Germany, respectively.

Charleroi, *shahr le roi'*, Pa., a borough in Washington co., 40 mi. s. of Pittsburg, on the Monongahela River and on the Pennsylvania railroad. It has extensive glass works and shovel factories. The place was settled in 1890 and was incorporated in the next year. Population in 1910, 9615.

Charles, the name of many European monarchs. Among them may be mentioned *kings of France,* Charles I, the Bald (823–877), Charles II, the Fat (839–888), Charles III, the Simple (879–929), Charles IV, the Fair (1294–1328), Charles V, the Wise (1337–1380) (See also CHARLES VI; CHARLES VII; CHARLES VIII; CHARLES IX; CHARLES X; of France); *Holy Roman emperors,* Charles IV (1316–1378) and Charles VII (1697–1745) (See also CHARLES V; CHARLES VI; Holy Roman emperors); Charles II, the Bad (1332–1387), king of Navarre; *kings of Spain,* Charles II (1661–1700), Charles III (1716–1788), and Charles IV (1748–1819); *kings of Sweden,* Charles IX (1550–1611), Charles X, Gustavus (1622–1660), Charles XI (1655–1697), Charles XIII (1748–1818) and Charles V (1826–1872) (See also CHARLES XII; CHARLES XIV JOHN; kings of Sweden); and *kings of England* (See CHARLES I; CHARLES II; of England). See also CHARLEMAGNE.

Charles I (1600–1649), king of Great Britain and Ireland, son of James I. He married Henrietta Maria, daughter of Henry IV of France, and in 1625 succeeded to the throne. After dissolving three Parliaments, because they would not grant him money unconditionally, he concluded to reign alone. This he did for eleven years, using the arbitrary courts of High Commission and Star Chamber as a kind of cover for pure absolutism, and raising money by unconstitutional or doubtful means. His attempts to introduce an Anglican liturgy into Scotland produced violent tumults, and gave origin to the famous *Covenant* in 1638, to oppose the king's design. An English army was sent north, but was defeated by the army of the Covenanters, and in 1640, to secure funds to put down the Scottish insurrection, Charles was compelled to summon Parliament. The body which assembled at that time became the famous Long Parliament. Charles agreed no better with this assembly than he had with the earlier Parliaments, and matters soon came to open rupture. The king had on his side the great bulk of the gentry, while nearly all the Puritans and the inhabitants of the great trading towns sided with the Parliament. The first action, the Battle of Edgehill, gave the king a slight advantage; but nothing very decisive happened till the Battle of Marston Moor, in 1644, when Cromwell routed the royalists. The loss of the Battle of Naseby, the year following, completed the ruin of the king's cause. Charles at length gave himself up to the Scottish army at Newark, in 1646, and by them he was handed over to the English Parliament. His death was at length demanded by the army, he was brought to trial, condemned and beheaded, meeting his fate with great dignity and composure.

Charles II (1630–1685), king of Great Britain and Ireland, son of Charles I and Henrietta Maria of France. After his father's defeat in the Civil War Charles left England for France, and on his father's death he took the title of king of England. In 1651 he accepted an invitation from the Scots, who had proclaimed him their king, and passing over to Scotland, was crowned at Scone. Cromwell's approach made him take refuge among the English royalists, who, having gathered an army, encountered Cromwell at Worcester and were totally defeated. Charles escaped to France. On the death of Cromwell, the Restoration, effected without a struggle by General Monk, set Charles on the throne, and his entry into the capital (May 29, 1660) was greeted with universal acclamations. His Parliament soon allowed to him all the prerogatives which an earlier Parliament had fought to prevent Charles I from assuming, and he resorted to various illegal measures for obtaining money to support his extravagant court. Charles and the court by which he was surrounded displayed the most disgraceful licentiousness.

Charles VI (1368–1422), king of France, son of Charles V, whom he succeeded in 1380. His four uncles, who ruled during his minority, were in constant conflict, and the result was that when Charles took the power in his own hands he found the country in a most disturbed condition. For several years he ruled wisely, but he became insane in 1392, and his great vassals at once recommenced their conflicts. Henry V of England, taking advantage of the disturbed condition of France, invaded the country and won several important victories, by means of which he compelled Charles VI to acknowledge him as his successor on the throne of France.

Charles VII (1403–1461), king of France, son of Charles VI, whom he succeeded in 1422. The crown of France at his accession was claimed by the English for their king, Henry VI, in accordance with a treaty wrung from Charles VI, and the English had possessed themselves of the greater part of France. Charles seemed utterly incapable of asserting his rights, and it was not until the appearance of Joan of Arc in the French army that things began to look favorable for the French. In 1429 Charles was crowned king, and gradually the English were driven from France. Charles was a weak ruler, but the country was fairly prosperous during his reign.

Charles VIII (1470–1498), king of France, son of Louis XI, whom he succeeded in 1493. When Charles assumed the rule, he found France in a prosperous condition, owing to the wise regency of his sister, and Charles himself proved a good king. His reign is memorable chiefly because during it was begun the interference of France in Italy, which played so large a part in the history of both countries during the centuries which followed. Charles won some initial successes in Italy, but was at length forced to withdraw from the country.

Charles IX (1550–1574), king of France, son of Henry II. He came to the throne on the death of his brother, Francis II, in 1560. Even after he was declared of age, his mother, Catharine de' Medici, who had been regent during his minority, held the chief power, and his rule was from the beginning much disturbed by the conflict between the Catholics and Protestants. These conflicts terminated in the massacre of Saint Bartholomew's Day (1572), to which Charles, through the influence of his mother, had been obliged to give his consent. His remorse over this massacre was extreme.

Charles X (1759–1836), king of France, grandson of Louis XV. When the Revolution broke out in 1789, he left France and remained in exile until the restoration of the Bourbons. During the reign of his brother, Louis XVIII, he systematically opposed all liberal measures, and after his own accession to the crown in 1824 he adopted the most reactionary policy. Public dissatisfaction was so great that in July, 1830, Charles was forced to abdicate. This he did in favor of his grandson, the duke of Bordeaux, but Louis Philippe had already been chosen king, and Charles was forced to flee from France.

Charles V (1500–1558), Holy Roman emperor, and, as Charles I, king of Spain, the grandson of Ferdinand and Isabella of Spain and of the Emperor Maximilian. He became possessed, on the death of his father, archduke of Austria, in 1506, of the Netherlands; became king of Spain on the death of Ferdinand in 1516, and three years later, when Maximilian died, was chosen as emperor over Francis I of France and Henry VIII of England. A contest with France immediately ensued, in which Charles was completely successful; he captured Francis at Pavia and forced from him a humiliating treaty. In 1527 Rome was captured by the imperial army, and the pope was taken prisoner, but Charles pretended to have been ignorant of the plans for this move.

Had Charles been able, at the beginning of his reign, to have turned his attention to religious matters in Germany, he might have prevented the growth of Protestantism. When, however, he did take up the question, he found that the Protestants were so strong that he was obliged to grant them concessions. A war with the Turks, a conflict with pirates and a struggle with France took his attention until 1544, when he again turned his attention to religious matters. Open war with the Protestants ensued, in which Charles was at first successful, but later defeats obliged him in 1552 to grant religious freedom to German Protestants. In 1555 he abdicated, giving Spain with the Netherlands to his son Philip, while his brother Ferdinand succeeded him as emperor.

Charles VI (1685–1740), Holy Roman emperor. When Charles II of Spain died childless, Charles claimed the throne as a rival to Philip of Anjou, who had been chosen by Charles II as his successor. The result was the War of the Spanish Succession, in which Charles had the aid of Great Britain and Holland. On the death of his brother, however, he became emperor, and England and Holland refused to aid him further in his fight for the Spanish throne. A war with the Turks and a war with Spain, in which he engaged, both terminated successfully. The latter years of this reign were spent largely in an attempt to secure the consent of the European powers to a pragmatic sanction settling the succession on his daughter, Maria Theresa.

Charles XII (1682–1718), king of Sweden. On the death of his father, Charles XI, in 1697, he was declared of age by the estates. To his jealous neighbors this seemed a favorable time to humble the pride of Sweden, and Frederick IV of Denmark, Augustus of Poland and Peter the Great of Russia concluded an alliance which resulted in war against Sweden. With the aid of an English and Dutch squadron the Danes were soon made to sign peace, but Augustus and the czar were still in the field. Charles won several victories which, considering his youth and inferior forces, were remarkable, but at length he was completely defeated at Pultowa (1709). He fled with a small guard and found refuge and an honorable reception at Bender, in the Turkish territory. Here he managed to persuade the Porte to declare war against Russia; but peace was soon procured, the interests of Charles were neglected, and he was forced by the Turkish government to leave. Arriving in his own country in 1714, he set about the measures necessary to defend his kingdom against the Danes and Prussians, and the fortunes of Sweden were beginning to assume a favorable aspect when he was slain by a cannon ball as he was besieging Frederikshald.

Charles XIV John (1764–1844), king of Sweden and Norway, originally Jean Baptiste Jules Bernadotte, a French general, the son of a lawyer of Pau. He enlisted at seventeen, received successive promotions and became in 1794 general of division. He distinguished himself greatly in the campaign in Germany and on the Rhine. In 1799 he became for a short time minister of war, and on the establishment of the Empire he was raised to the dignity of marshal of France, with the title of prince of Pontecorvo. On the death of the heir apparent to the Swedish crown the prince of Pontecorvo was chosen as crown prince, went to Sweden, abjured Catholicism and took the title of Prince Charles John. In the maintenance of the interests of Sweden a serious rupture occurred between him and Bonaparte, followed by his accession in 1812 to the coalition of sovereigns against Napoleon. At the Battle of Leipzig he contributed effectually to the victory of the allies. At the close of the war strenuous attempts were made by the emperor of Austria and other sovereigns to restore the family of Gustavus IV to the throne; but Bernadotte, retaining his position as crown prince, became king of Sweden on the death of Charles XIII in 1818, under the title of Charles XIV. During his reign agriculture and commerce made great advances, and many important public works were completed.

Charles Edward, the young pretender. See Stuart, Charles Edward.

Charles Martel' (about 688–741), ruler of the Franks, a son of Pippin Héristal. The king still held the appearance of power, but the real authority was in the hands of Charles. He rendered his rule famous by the great victory which he gained at Tours, in 732, over the Saracens, whom he thus prevented from advancing their power in Europe. It was this victory which won for him the name of *Martel*, signifying *hammer*.

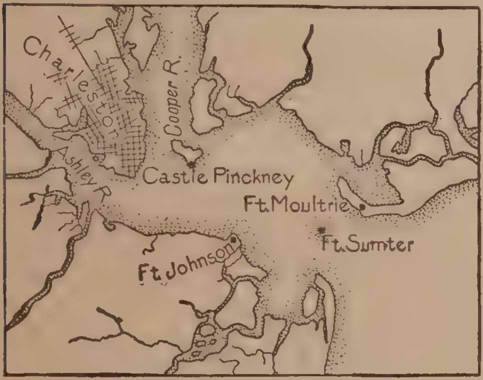
Charles River, a river in Massachusetts, which flows into Boston harbor, dividing Boston from Charlestown. The chief towns on its banks are Waltham, Watertown, Cambridge and Boston.

Charles the Bold (1433–1477), duke of Burgundy, the last of the great French vassals who succeeded in opposing the power of the king. He was the greatest lord in the kingdom, ruling, besides Burgundy, Flanders and a large part of the Netherlands, and for years he successfully defied the authority of Louis XI, with whom he was constantly at war. His ambition was to reëstablish the old kingdom of Burgundy, which had included Lorraine and Switzerland, and in pursuance of this ambition he took Lorraine in 1476 and entered Switzerland with an army. In the three battles which he fought here, he was completely defeated and in the last he was killed.

Charleston, *chahrlz'ton,* Ill., the county-seat of Coles co., 48 mi. w. of Terre Haute, on the Cleveland, Cincinnati, Chicago & Saint Louis and the Toledo, Saint Louis & Western railroads. The city is in a farming region and has manufactures of flour, woolen goods, stoves and other articles. The Eastern Illinois normal school is located here. Charleston was settled in 1830 and was incorporated in 1855. Population in 1910, 5884.

Charleston, S. C., the county-seat of Charleston co., on a peninsula formed by the Ashley and Cooper rivers, 7 mi. from the ocean, 130 mi. s. e. of Columbia, on the Atlantic Coast Line and the Southern railroads. It is the largest city in the state and is of considerable historic and scenic interest. The educational institutions include the Charleston College, South Carolina Medical College, the South Carolina and the Porter Military academies and Avery Normal Institute. There are more than seventy churches, almost one-half of which are for colored people, and many charitable institutions.

In the early days of the nineteenth century, Charleston was the chief cotton port in the United States, but the Civil War ruined most of the trade. The exports are chiefly cotton, naval stores and manufactured goods, while the imports are jute, tropical fruits and sulphur. There are various manufacturing establishments, including cotton factories, rice mills, sash and blind factories, foundries, breweries, flour mills and other works. The government navy yard established here cost between twelve and fifteen million dollars. In 1670 an English colony made a settlement on the west bank of the Ashley River, three miles from the present site, and called it Charles Town, in honor of Charles II of England. This was removed to the present location ten years later; the city was incorporated in 1783 and was the capital of the state until 1790. Charleston was the first Southern town to join the revolutionary movement, and in 1776 the South Carolina convention here adopted the first independent state constitution. During the Revolutionary War the city was several times attacked by the British. It was here also that the Civil War was begun by the Confederate bombardment of Fort Sumter, April 12 and 13, 1861 (See Fort Sumter). During the war it withstood numerous attacks from the sea and was held by the Confederates until General Sherman took possession, February 18, 1865. On August 31, 1886, one of the severest earthquakes in the history of the United States shook the city, destroying more than $8,000,000 worth of property, rendering seven-eighths of the houses unfit for habitation and killing many people. Population in 1910, 58,833, of whom about one-half are of negro descent.



CHARLESTON HARBOR IN 1861

Charleston, W. Va., the capital of the state and the county-seat of Kanawha co., 130 mi. s. w. of Wheeling, at the confluence of the Kanawha and Elk rivers, and on the Chesapeake & Ohio, the Ohio Central and other railroads. The principal buildings are the capitol, the customhouse, the courthouse, an opera house and a hospital. There are regular lines of steamboats on the river, and considerable shipments of coal, salt and lumber are made. There is a large supply of natural gas in the vicinity. The industrial establishments are shipyards, railroad shops and manufactures of iron, engines, furniture, brick, lumber, woolens and other articles. Charleston grew up around a fort which was built in 1786. It was incorporated as a town in 1794 and as a city in 1870. It has been the capital of the state since 1870, except during the decade from 1875 to 1885. Population in 1910, 22,996.

Charlotte, *shahr'lot,* N. C., the county-seat of Mecklenburg co., 125 m. s. w. of Raleigh, on Sugar Creek and on the Seaboard Air Line and two branches of the Southern railroad. The city is in the coal-mining region, and it contains extensive manufactures of cotton, iron, mill supplies, clothing and other articles. The place was settled about 1750 and was made the county-seat in 1774. During the Revolution the town was occupied by Lord Cornwallis and was later the headquarters of General Gates. Population in 1910, 34,014.

Charlottenburg, *shahr lot'ten boorg,* a town of Prussia, on the Spree, about 3 mi. from Berlin, of which it is a residential suburb. It was named from the castle erected for Queen Charlotte by Frederick I, in 1699. This building is one of historical interest, and in the garden is the royal tomb in which are the remains of Frederick William III, Queen Louisa, Emperor William I and Empress Augusta. The famous royal porcelain factory, established in 1761, is located here. The suburb is an important educational center and contains among other institutions a technical academy, a royal institute of glass painting, an artillery and engineering school and a gymnasium. The industries include the manufacture of machines, glass, pottery, paper, leather and chemicals. Population in 1900, 189,000.

Charlottesville, *shahr'lots vil,* Va., the county-seat of Albemarle co., 96 mi. s. w. of Washington, on the Chesapeake & Ohio and the Southern railroads. The University of Virginia, Albemarle College and Rawlings Female Institute are located here, and Monticello, the old home of Thomas Jefferson, is three miles east of the city. The place contains woolen, flour and planing mills. It has electric lights and street railways. Population in 1910, 6765.

Charlottetown, *shahr'lot town,* the capital of Prince Edward's Island, situated on Hillsborough Bay on the southern coast and on an excellent harbor. The important buildings are the government buildings, Dominion buildings, courthouse, athenaeum, city hall and Y. M. C. A. building. The public institutions include several hospitals, an asylum for the insane, a normal school, Prince of Wales College, Saint Dunstan's College and a Methodist college, besides a number of churches. The leading industries include an iron froundry, railroad shops, carriage and wagon factories and woolen mills. The fisheries are also important. A considerable trade is carried on and steamer connection with the principal ports of Canada is maintained. A railway also extends east and west, connecting the principal points on the islands. Charlottetown was settled by the French about 1750 and was named Port La Joie. Population in 1901, 12,080.

Charon, *ka'ron,* in Greek mythology, the son of Erebus and Night. It was his office to ferry the dead in his boat over the rivers of the infernal regions. He was represented as an old man of gloomy aspect, with matted beard and tattered garments.

Chart, a hydrographical or marine map of some part of the earth's surface, with the coasts, islands, rocks, banks, channels or entrances into harbors, rivers and bays, the points of compass, soundings, or depth of water, all carefully marked out to regulate the courses of ships in their voyages. Charts are usually more accurate than maps. A *plane chart* is one in which the meridians are supposed parallel to one another, the parallels of latitude at equal distances, and of course the degrees of latitude and longitude everywhere equal to one another. A great number of excellent charts are produced and sold at very low prices by the United States Coast Survey and the Hydrographic Office of the navy, the former confining its work to the coast of the United States (See Coast and Geodetic Survey, United States). Similar charts are made by the Hydrographic Office of the British Admiralty.

Char'ter, a written instrument, given as evidence of a grant, contract or other important transaction between man and man. Charters are granted by sovereigns to convey certain rights and privileges to their subjects, such as the *Great Charter,* granted by King John, and those granted by various sovereigns to boroughs and municipal bodies, to universities and colleges, or to colonies and foreign possessions. Somewhat similar to these are charters granted by the state to banks and other companies or associations.

Charterhouse, a famous hospital and school in London. It was first a Carthusian monastery, founded in 1371. It came into the hands of Sir Thomas Sutton, who in 1611 converted it into an almshouse and a free school and richly endowed it. The almshouse offers an asylum to poor men, and the pensioners must be over fifty years of age, bachelors and members of the Church of England. The grammar school was originally limited to a membership of forty, but it has grown until at present it is among the first public schools in England. Among the famous men who were educated here are Addison, Steele, John Wesley, Grote and Thackeray.

Charter Oak, a tree that formerly stood in Hartford, Conn., associated by tradition with an interesting episode in Connecticut history. In 1687 Sir Edmond Andros, who had been appointed governor general of New England, went to Hartford and demanded the delivery of the charter. The colonists appeared to submit, but at the time when the ceremony was to be carried out the lights in the council chamber were extinguished and the document was carried to a hiding place in the hollow of a tree. It remained there for two years, until the deposition of Andros. Early reports of this episode referred to the tree as an elm, and some declared that the instrument was hidden in the home of a prominent colonist; but about 1789 the belief became general that this oak had concealed the famous charter, and the tree was held in the greatest reverence until it was blown down in August, 1856.

Chart'ism, a name given to a movement in the interests of radical reform, which was at its height in England between 1838 and 1848. The Reform Bill of 1832, while it had mended matters somewhat, had still not silenced the discontent among the laboring classes, and by 1838 matters had come to such a point that a committee of six members of Parliament and six workingmen drew up a formal demand, known as the People's Charter. The reforms demanded were six in number: (1) universal suffrage; (2) equal electoral districts; (3) vote by ballot; (4) annual Parliaments; (5) no property qualification for members of Parliament; (6) salaries for members of Parliament. Despite the fact that the agitation for these measures in some places grew violent, that monster petitions were presented to Parliament and meetings held throughout the country for years, nothing definite was accomplished, and after 1848 the movement gradually died out, as reforms beneficial to workingmen were introduced.

Chartres, *shahr'tr'*, a city of France, capital of the Department Eure-et-Loir, 49 mi. s. w. of Paris. The cathedral, one of the most magnificent in Europe, is rendered conspicuous by its two lofty spires. Chartres has manufactures of woolen hosiery, hats, earthenware and leather and is an important grain market. It is one of the most ancient cities of France. After its reunion with the crown, it was made a duchy by Francis I. Henry IV of England was crowned here in 1594. Population in 1901, 19,700.

Charybdis, *ka rib'dis*, an eddy or whirlpool in the Straits of Messina, celebrated in ancient times, and regarded as especially dangerous to navigators, because in endeavoring to escape it they ran the risk of being wrecked upon Scylla, a rock opposite to it.

Chase, SALMON PORTLAND (1808–1873), an American statesman and jurist, born in New Hampshire. He graduated at Dartmouth College, taught school for a time, but having adopted the law as his profession, settled at Cincinnati and acquired a large practice there. He early showed himself an opponent of slavery and was active in the founding of the Free-Soil party. From 1849 to 1855 he was United States senator and vigorously opposed the extension of slavery into the new territories, being the leading opponent of the Kansas-Nebraska Bill. In 1855 he was elected governor of Ohio and he was reëlected in 1857. In 1860 he was an unsuccessful candidate for the presidency and became secretary of the treasury in Lincoln's cabinet. In this post he was signally successful in providing funds for carrying on the Civil War, but he showed some opposition to Lincoln's war policy and resigned in 1864. In the same year he was appointed chief justice of the Supreme Court, and in that capacity presided over the impeachment trial of President Johnson, winning high praise for his dignity and fairness.

Chat, a popular name of a number of different small, lively birds of the warbler family. They move about incessantly and rapidly in the pursuit of the insects on which they live. In the United States the so-called yellow-breasted chat is a larger bird, olive-green above and white below, with a yellow breast. Its song is a mixture of various songs, usually uttered only during the mating season, when the males carry on the most extraordinary performances in the air.

Chateaubriand, *sha to'bre ahN'*, FRANÇOIS RENÉ AUGUSTE, Vicomte de (1768–1848), a celebrated French author and politician. At the outbreak of the Revolution in France he set out for America, with the original intention of accompanying an expedition in the search for the northwest passage to India. He went no farther than America, however, and the impressions he received of the country had a strong effect on some of his later writings. After taking part, on his return to France, in the attempts of the royalist emigrants to restore the old monarchy in France, he was obliged to flee to England. While there he published his *Essay on Revolutions*, which was not well received. At this time the death of his mother and the accounts of her last moments helped to effect a certain change in the religious opinions of Chateaubriand, and from a not very profound skeptic he became a not very profound believer. In 1800 he returned to France, in the following year published his romance of *Atala*, the scene of which is laid in America, and the year after, his celebrated work, *The Genius of Christianity*. Style, power of description and eloquence are the merits of the book, rather than depth of thought; but it carried the author's reputation far and wide and contributed much to the religious reaction of the time.

For a short time Chateaubriand served in diplomatic positions under Napoleon, but later he turned against him and wrote *Bonaparte and the Bourbons*, which had a large part in the Bourbon restoration. After the restoration he held various diplomatic positions, but in his later years he took no part in public life, spending his time in literary pursuits. Among the works of this later period the most important is his autobiography.

Chatham, *chat'am*, a town, naval arsenal and seaport in County Kent, England, on the Medway, about 30 mi. e. s. e. of London. The importance of Chatham is due to the naval and military establishments at Brompton, in its immediate vicinity. The royal dockyard was founded by Queen Elizabeth previous to the sailing of the Armada. It has been greatly enlarged in recent years and is now about two miles in length, with capacious docks, in which the heaviest war ships can be equipped and sent directly to sea. Building slips, saw mills, metal mills, repair shops and all the requisites of a great naval station are here on the largest scale and in the finest order. The military establishments include extensive barracks, arsenal and park of artillery, hospital, storehouses and magazines. Population in 1901, 37,057.

Chatham, Ontario, a city of Canada, situated on the Thames River, 45 mi. n. e of Detroit, Mich., and on the Grand Trunk and the Erie & Huron railways. The leading industries include the manufacture of iron goods, wagons, soap, tobacco and woolens. The town is in the midst of a rich agricultural region, and it has an extensive trade in grain, since it can be reached by boats from lakes Ontario and Erie. Population in 1901, 9068.

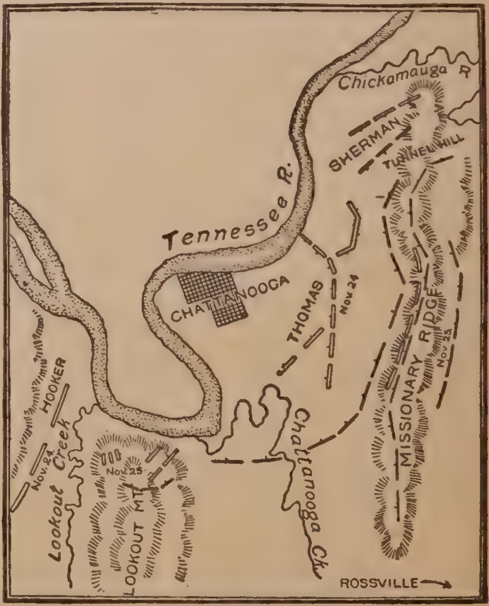
Chatham, Earl of. See Pitt, William.

Chatham Islands, a group of three islands in the South Pacific Ocean, 380 mi. e. of South Island, New Zealand. The soil is in many places fertile, and crops of potatoes, wheat and vegetables are successfully grown. Cattle and sheep are reared, and whaling and other vessels are supplied with fresh provisions and water. The islands were discovered in 1791 and are now a province of New Zealand. Population in 1901, 419.

Chattahoo'chee, a river rising in the Appalachian Mountains in Georgia, and forming for a considerable distance the boundary between Georgia and Alabama. In its lower course, after the junction of the Flint River, it is named the Appalachicola, and it is navigable to Columbus, Georgia, for steamboats. The length of this river is 500 miles.

Chattanoo'ga, Tenn., the county-seat Hamilton co., 150 mi. s. e. of Nashville, on the Tennessee River. It is picturesquely situated just north of Lookout Mountain, and is an important commercial and manufacturing center. The Tennessee River, and the Southern, the Queen & Crescent, the Central of Georgia, the Nashville, Chattanooga & Saint Louis and other railroads give it an outlet in all directions. There are various manufactures of iron, steel, flour, cotton goods, lumber and wood products, brick, tile, paints, agricultural implements, patent medicines and other articles. There is considerable trade in grain, iron, coal and lumber. The University of Chattanooga and several good preparatory schools are located here. Among the important buildings are the custom house, the Erlanger Hospital, the Carnegie library, the opera house, Patton Hotel, Times building and many large business and office buildings. The place was settled in 1836 and was known as Ross's Landing. It was incorporated in 1837. Several important battles of the war between the states were fought here, the most important being the Battle of Chickamauga, the site of which is now occupied by the Chickamauga National Park. Population in 1910, 44,604.

Chattanooga, Battles of, three simultaneous battles in the Civil War, which together constitute one of the most important engagements in the struggle. They occurred near Chattanooga, Tenn., Nov. 23–25, 1863. The Federal army of 60,000 was under the supreme command of General Grant and faced a Confederate army



BATTLES OF CHATTANOOGA

of about 40,000, under General Braxton Bragg. The latter had defeated Rosecrans at Chickamauga and had taken up a position before Chattanooga, extending from Lookout Mountain along Missionary Ridge for a distance of about twelve miles. To Sherman, Grant assigned the task of attacking the extreme right of the Confederate line and advancing along Missionary Ridge toward the center of their position. General Thomas was to attack the enemy in the center and attempt to dislodge them. General Hooker was to attack the left of their position and drive them from Lookout Mountain. Sherman was at first successful, but was stopped by a strongly fortified gap in the mountain ridge. Thomas gained slight successes during the first day's battle, while Hooker, in the famous "Battle above the Clouds," completely routed the enemy. On the following morning Thomas's troops, ordered to make a general assault on the enemy's works at the foot of Missionary Ridge, not only accomplished this after a stubborn contest, but pressed forward without orders, under the leadership of regimental officers, climbed the hill in the face of almost irresistible fire and drove the Confederates in confusion from the summit, ending the battle.

Chat'tel, a term in law nearly synonymous with *personal property* (See PERSONAL PROPERTY). Technically, it includes that part of personal property which can be physically delivered and possessed. This excludes so-called *choses in action*, which consist of merely legal rights to possess, as the right to recover the value of goods bought but not yet delivered. Chattels may be *real* or *personal*. A chattel real is any interest in land less than a freehold, for instance, a leasehold. All other chattels are chattels personal.

Chattel Mortgage. See MORTGAGE.

Chat'terton, THOMAS (1752–1770), a boy poet, one of the greatest prodigies in the history of English literature. He pretended to have gained possession of several old manuscripts, and the forgeries which he produced deceived some of the most eminent men of the day, among them Horace Walpole. These so-called "Rowley Poems," some of which possess rare beauty of imagination, are his chief claim to fame. The most remarkable are *The Tragedy of Godwin*, *The Tournament*, *The Parliament of Sprites* and *The Tragedy of Aella*. Chatterton's poems were favorites of Coleridge, Keats, Rossetti and William Morris.

Chaucer, *chaw'sur*, GEOFFREY (1340?–1400), one of the greatest of English poets, known as the "Father of English Poetry." Little is known of Chaucer's boyhood or of his education. It is certain, however, that during the English invasion of France in 1359 and 1360 he was imprisoned, was finally ransomed by the king and was made a squire in the king's service. Various missions on the continent were entrusted to him, in 1374 he was made comptroller of customs for London and in 1386 he became a member of Parliament. He was, especially during the latter part of his life, very poor, and his poverty was relieved by Henry IV only a year before Chaucer's death. His connection with court matters and with business matters and his lasting place in literature show that he must have been a man of the greatest versatility.

In the early part of his literary career Chaucer contented himself with translations from the French. He then came under the influence of Italian literature, and this influence shows plainly in such productions as *Troylus and Cryseyde*, *The Legende of Good Women* and *The Parlement of Foules*. In his third and greatest period he was thoroughly English in his theme and in his treatment of it. His masterpiece, *The Canterbury Tales*, was, indeed, in its form modeled somewhat after Boccaccio's *Decameron*, in that it comprised the tales of a number of persons. Chaucer's scene, however, is English, his personages are pilgrims who are journeying from the Tabard Inn to the tomb of Thomas à Becket, and the poem gives a marvelous picture of the life of the day in England. The pilgrims, who come from every rank of English society, are drawn with a masterly hand, so that even to-day we feel their individuality The tales which were related on the journey were never completed, but those that have come down to us show that Chaucer was entitled to a rank among English poets below Shakespeare and Milton only.

Chaudière, *sho dyair'*, a river of Canada, province of Quebec, which rises on the borders of Maine, near the sources of the Kennebec, and flows into the Saint Lawrence about 6 miles above Quebec. It is 120 miles long. The banks are steep and rocky. Three miles above the river's junction with the Saint Lawrence are Chaudière Falls, about 120 feet high.

Chauffeur, *sho'fer*. See AUTOMOBILE.

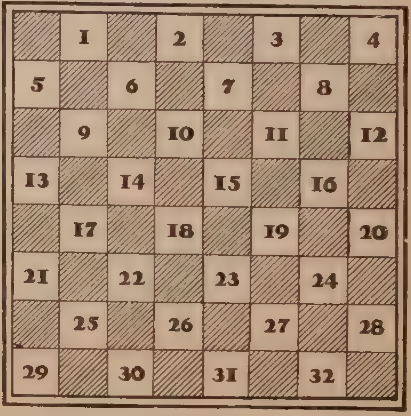
Chautau'qua Literary and Scientific Circle, an organization for the promotion of systematic home reading, founded at Chautauqua, N. Y., in 1878. This organization was the outgrowth of the Chautauqua Assembly, founded in 1874 by Reverend (later Bishop) John H. Vincent and Lewis Miller. The arrangement provides courses of reading in literature, history, various branches of science, art, economics and sociology. Most of the books are prepared by eminent scholars and are especially adapted to the work. Each course covers four years, and one completing the work is granted a certificate, but the circle does not confer degrees. The work is of a very general character, but it is planned to give the reader a college view of the subjects. Local circles are organized, and these meet at frequent intervals and have regular programs, which provide for the discussion of the work. Members write papers or contribute to the interest of the circle in other ways. The *Chautauquan,* which is the official organ of the circle, contains supplementary matter which is designed to assist the members in their studies. During the first twenty years following its establishment, 10,000 circles were organized, with over 250,000 members. Of these about 40,000 completed the course.

The Chautauqua system, which is the center of this movement, includes the school of English language and literature, the school of modern languages, the school of classical languages, the school of mathematics and science, the school of social sciences, the school of pedagogy, the school of religious teaching, the school of music, the school of fine arts, the school of expression, the school of physical education, the school of domestic science and the school of practical arts. The object of the movement was to provide means whereby those engaged in various occupations could, by home study and the expenditure of a short time during the summer, acquire a working knowledge of the various branches of learning. The school holds a summer session at Chautauqua, N. Y., each year. At this opportunities are given for study under instructors who are specialists in the various branches, or for the pursuit of the subjects in a more popular way by attending courses of lectures. Arrangement can also be made whereby students can pursue the work through the year by correspondence.

Cheboygan, *she boi'gan,* Mich., the county-seat of Cheboygan co., 165 mi. n. w. of Bay City, on Lake Huron, at the outlet of the Cheboygan River, and on the Detroit & Mackinac and the Michigan Central railroads. The city has a good harbor and ships large quantities of lumber and agricultural produce. It contains extensive flour and lumber mills, shipyards and fisheries. The waterworks are owned by the city. It was settled in 1849 and was incorporated in 1877. Population in 1910, 6859.

Check, an order to a bank to pay a certain sum to a certain person, or to bearer, on presentation of the order. If the check is payable to the bearer, it is transferable without endorsement and is payable to any one who presents it; if payable to order, to be transferred, it must be *endorsed,* that is, the person in whose favor it is drawn must write his name on the back of it. Checks are a very important species of mercantile currency wherever there is a well-organized system of banking. The regular use of them for all payments, except of small amount, makes the transfer of funds through banks a mere matter of bookkeeping and tends greatly to economize the use of the precious metals as a currency. Paid checks are returned at intervals to the drawer, and thus serve as receipts in the transactions which they represent.

Check'ers, a very old game played with checkers or "men" on a board of sixty-four black and white squares. It was played in Europe in the sixteenth century, and in 1668 a treatise on the game was published in Paris by Mallet. The Greeks and Romans had a similar game, and the Egyptians are represented on monuments as engaged in some such amusement. The figure represents the board, numbered in the usual method for registering games. Two players, each having a set of twelve men—one set white, the other black (or round and square, or distinguished in any other way)—sit opposite each other, having their men arranged



CHECKER BOARD

on squares 1 to 12 and 21 to 32, respectively. The men can be placed either on the black or white squares, but all must be placed on one color only. Whichever color is used, however, the single corners 4 and 29 must be at the players' left hand. The object of the game is to clear off the opponent's men altogether from the board, or so to shut them up that they cannot be moved. Generally the black men play first, and as the men are changed each game, the first move becomes alternate. Each player alternately moves one man at a time diagonally forward, always keeping on the same colored squares. When an enemy's man stands in the way, no move can be made unless there be a vacant square immediately beyond, into which the man can be lifted, in which case the man leaped over is "taken," and removed from the board; and so on, till the game is lost and won, or drawn. When a man on either side has succeeded in making his way to the opposite side of the board, he becomes *crowned*. This is done by putting another man on the top of him, and he can then move in any diagonal direction, but always only one square at a time, except in the taking of the opponent's men.

Cheese, *cheez*, an important dairy product, composed principally of the casein in milk. Cheese is made by curdling the milk with acid, sour milk or rennet, separating the whey from the curd, then grinding and salting the curd, packing it in molds and placing it under pressure to remove the remaining whey and water. In the United States nearly all cheese is made in factories. These sometimes use the milk from three hundred or more cows. Rennet is used for curdling, and the most of the cheese made is of the Cheddar variety. Cheese can be made from new milk, skim milk or milk from which only a portion of the cream has been removed. New York and Wisconsin are the leading cheese-producing states. In other countries the milk of goats and sheep is used to some extent for making cheese. More than one hundred fifty varieties of cheese are made in America and Europe. A good quality of cheese is nutritious and forms a desirable article of food. The quality is improved by ripening, that is, by keeping the cheese for several months in a cool place. See DAIRYING; MILK.

Cheese Fly, a small black insect which sinks its eggs deep in the cracks of cheese, ham and beef. The maggot, which is known as the *cheese-hopper*, has two horny, claw-shaped mandibles with which it digs into the cheese and moves about, as it has no legs. By bringing the two ends of its body together and separating them by a jerk, it can throw itself twenty or thirty times its own length.

Chehalis, WASH., the county-seat and largest city of Lewis co., is situated on the Chehalis and Newaukum rivers, 94 mi. s. of Seattle, and on the Northern Pacific, the Union Pacific and Great Northern railroads. The chief manufactures are lumber and lumber products including sash, doors, shingles and furniture. Other important manufactories are brick and tile works, a condensed milk factory, machine shops, granite works, cement works and creameries. Population in 1910, about 5000.

Chelsea, *chel'se*, a suburb of London, England, on the north bank of the Thames. It contains a royal military hospital, begun by James I as a theological college, but converted by Charles II into an asylum, for the reception of sick, maimed and superannuated soldiers; the Sloane Botanic Gardens; Saint Luke's church of the fourteenth century, and the Royal Asylum for Soldiers' Children. Chelsea was the home of Sir Thomas More, Walpole, Swift, Leigh Hunt, Carlyle and George Eliot. Population in 1901, 73,856.

Chelsea, MASS., a city of Suffolk co., separated from East Boston by Mystic River, on the Boston & Maine railroad. The principal industries are foundry and machine shop products, curried leather, cotton goods, tobacco, rubber, linseed oil, woolens and paper box manufactures. Chelsea contains a United States marine hospital, a powder magazine and a naval hospital. Population in 1910, 32,452.

Cheltenham, *chel't'n am*, a fashionable watering place in England, in the County of Gloucester, within the shelter of the Cotswold Hills. It grew rapidly into a place of fashionable resort after the discovery, in 1716, of its saline, sulphuric and chalybeate springs, to which, in 1788, George III paid a visit. It contains no factories and is an educational center. Population in 1901, 49,439.

Chemistry, *kem'is try*, the science which treats of the different kinds of matter in the universe, their properties, laws of combination and relations to one another.

HISTORY. As a science it is of modern origin, but at a very early date it existed as *alchemy*, the great object of which was the discovery of the philosopher's stone (See ALCHEMY). Although much time was wasted in this vain pursuit, some important discoveries were made, and many substances were prepared that were later of great use to chemists. Paracelsus did a great deal for modern pharmacy and medicine in the preparation of drugs. During the seventeenth century alchemy lost its hold on students, and new theories that paved the way for modern thoughts and beliefs were proposed by such men as Boyle, Becher, Stahl and others. Their ideas, though many of them wholly wrong, set men to thinking in the right direction. Black, Priestley, Scheele and Rutherford did important work in the study of gases and made valuable discoveries and separations. Lavoisier, in the latter part of the eighteenth century, was the first to use the balance and to determine substances quantitatively. He was followed by Sir Humphry Davy, Berzelius, Dumas and many modern chemists, all of whom perfected the science as known to-day.

It was during the time of Lavoisier that the names *element* and *compound* were correctly applied to many substances (See Elements). An *element* is a substance which cannot be separated into two or more different substances. A *compound* is a substance composed of two or more elements. The force which holds together the elements in the form of compounds is called *chemical affinity*. It also acts to break up compounds under certain conditions to form new compounds (See Atomic Theory).

Laws of Combination. (1) Chemical combination takes place between molecules (See Molecule) when they are very close together, as, for example, when in solution in the same liquid, or when melted together. (2) Chemical combination always effects a change in all bodies. There are changes of state, temperature, color, volume, taste and smell. (3) Chemical combination takes place with different degrees of force in different bodies. (4) Chemical combination is much affected by such forces at heat, light, electricity and mechanical force. which may either hasten or retard chemical combination. (5) All substances, elementary and compound, combine together in fixed and definite proportions by weight. (6) When bodies combine in more than one proportion, their other combining proportions are simple multiples of the lowest. Thus, 28 parts of nitrogen combine with 16 parts of oxygen to form nitrous oxide, while 28 parts of the former and 32 of the oxygen produce nitric oxide, and an additional 16 of oxygen form nitrogen trioxide. (7) Gases combine in fixed and definite proportions by volume as well as by weight. (8) The combining proportions of compounds are the sum of the combining proportions of their constituent elements.

Nomenclature. The names that have been given to the different elements sometimes owe their origin to mythology, or to some property they possess. No one system has been used. In modern times it is the custom to give metals a name ending in *um*, as radium, potassium. In choosing names for compounds, the aim has been to express the composition as far as possible. Thus: Sodium chloride, a compound of sodium and chlorine. If more than one atom of chlorine, for example, is present in a compound, it is called a bichloride or trichloride, depending on the number of chlorine atoms. To denote a combination of an element with oxygen, the name oxide is used, as calcium oxide. In general, when there are two oxides of an element, the name of the element ends in *ous* when there is less oxygen; and *ic* when there is more oxygen. Thus, ferrous oxide and ferric oxide are used to express the oxides of iron having, respectively, less and more oxygen. This termination in *ous* and *ic* also applies to other compounds of elements, such as salts and acids. A salt derived from an *ous* acid has a name ending in *ite*; one from an *ic* acid, a name in *ate*; thus, a salt from *sulphurous* acid is called a *sulphite*; from *sulphuric* acid, a *sulphate*.

Symbols. Each element in chemistry has a symbol to represent it. Usually it is the initial letter of the element, as *O* for oxygen and *H* for hydrogen. When two or more elements begin with the same letter, that letter with another prominent letter is used; thus, *Cl* for chlorine, and *Pt* for platinum. In some cases the old Latin name gives the symbol, as, *Au* for gold (*aurum*) and *Fe* for iron (*ferrum*). In writing a compound, the symbols are placed together; thus, NaCl for sodium (*natrium*) chloride. Each symbol so written indicates only one atom of that element. Where there are more than one atom present in a compound, the fact is expressed by a figure placed at the right of the symbol and below the line; thus, H_2O is the formula for water, which consists of two atoms of hydrogen and one atom of oxygen. To express a chemical reaction, the formulas or symbols are written in the form of an equation; thus $NaCl + AgNO_3 = AgCl + NaNO_3$, meaning that sodium chloride and silver nitrate react and form silver chloride and sodium nitrate. The formulas on the left mean the substances that take part in the reaction; those on the right, the ones that result from the reaction.

Branches of Chemistry. The science of chemistry is divided into various branches, the most general and important of which are these:

Organic, that division which treats of the carbon compounds. In early times it was thought that every organic compound had a vital principle, as it was called; that is, that it was formed by, or existed in, living plants and animals only. But when Wöhler in 1828 produced an organic compound, called urea, from its elements, this idea began to lose its hold on chemists, and when later other organic compounds were produced artificially, the theory of vital principle was wholly given up. Since all organic compounds contain carbon, the term *organic chemistry* is now defined as the chemistry of the carbon compounds.

Inorganic Chemistry, that division which treats of those compounds that are not united with carbon. The dividing line, however, is not very sharp; for example, carbon dioxide is usually regarded as an inorganic substance, and yet it is a carbon compound.

Some other special divisions of chemistry are:

Agricultural Chemistry, which deals with the problems of the farm and farm products.

Electro-Chemistry, which treats of the use of electricity in chemical problems.

Industrial Chemistry, which is the application of chemical ideas to manufacturing products.

Physical Chemistry, which is that part of the science dealing with physics in its relation to chemistry.

Thermo-Chemistry, which deals with heat changes taking place in chemical reactions.

Chemnitz, *kem′nits*, the principal manufacturing town in the kingdom of Saxony, on the Chemnitz River, 38 mi. s. w. of Dresden. The principal manufactures are white and printed calicoes, ginghams, handkerchiefs, woolen and half-woolen goods. There are also extensive cotton-spinning mills, and mills for the spinning of combed wool and floss silk, dye works, print works, bleach works and chemical works. The manufacture of machinery also has now become important. Population, 206,585.

Chenab, *che nahb′*, a river in Hindustan, one of the five rivers of the Punjab. It rises in the Himalayan ranges of Kashmir and, entering the Punjab near Sialkot, flows in a southwesterly direction till it unites with the Jehlam. Its length is about 800 miles.

Chenille, *she neel′*, a sort of ornamental fabric, of cord-like form, made by weaving or twisting together warp threads with a transverse filling, or weft, the loose ends of which project all round in the form of a pile. Chenille carpets have a weft of chenille, the loose threads of which produce a fine velvety pile.

Cheops, *ke′ops* the name given by Herodotus to the Egyptian despot whom the Egyptians themselves called Khufu. He lived at his capital, Memphis, about 2500 B. C. According to Herodotus he employed 100,000 men constantly for twenty years in building the Great Pyramid.

Cher, *shair*, a river of Central France, a tributary of the Loire, which it enters near Tours. Its length is about 200 miles.

Cherbourg, *sher boor′*, a city and fortified seaport of France, at the mouth of the Divette River, on the English Channel, 82 mi. w. by n. of Havre. Among the chief buildings are the Church of Sainte Trinité and that of Saint Clement, the Hotel de Ville, the Marine Library, a museum and a theater. The importance of Cherbourg is due to its immense defensive and naval works. These engineering works are the most gigantic of their kind in ancient or modern times. The commercial and naval ports are separate. The commercial port consists of a harbor and a basin about 1300 feet long and 1400 feet wide and is connected with the sea by a channel about 2000 feet long and 164 feet wide, lined with granite docks with parapets. The military port, which can accommodate 40 vessels of war, has three basins, is entirely cut out of solid rock and has a length of about 930 yards and a breadth of 437 yards. Cherbourg is also celebrated for its great breakwater, or *digue*, stretching across the harbor, which is protected on three sides by land, but is open to the sea on the north. This was commenced in the reign of Louis XVI and was completed under Napoleon III. It is 2¼ miles from the harbor. At the meeting of the two branches of the breakwater is a central fort or battery measuring 509 feet. The town is also defended by a number of other batteries on the sea, besides two important forts on the land. Population in 1901, 36,326

Cherbuliez, *sher bull lya′*, Charles Victor (1829–1899), a French author. He first won notice as an art critic, but he is chiefly known for his novels, among which the best are *Ladislas Bolski*, *Miss Rovel*, *Meta Holdenis* and *Samuel Brohl & Co.* In 1881 he was elected a member of the French Academy.

Cher'okee. This, the largest and most important of the indian tribes east of the Mississippi, was of Iroquoian descent, but separated into two great groups. The Upper Cherokee lived in log huts along the headwaters of the Tennessee and Cumberland rivers, where they cultivated corn, beans and pumpkins in abundance. The Lower Cherokee were wanderers and existed principally by hunting. Throughout the Revolution they sided with the British, but after the establishment of the government they acknowledged the sovereignty of the United States. The Cherokee proved a teachable race, intermarried freely with Scotch refugees and became Christianized and educated. In 1837 they organized the Cherokee nation. George Guess, or Sequoyah, invented an alphabet from which many books were printed in their language. One of the inexcusable cruelties of history was the treatment the Cherokee received from Georgia, who wanted their lands and who, by the aid of the United States troops, drove the indians out of the state. After a terrible march, the Cherokee finally settled in the Indian Territory, where, under their famous chief, John Ross, they again set up their government at Talequah. The Civil War again brought them in conflict with both the Confederate and Union armies, and it was only with the greatest difficulty that they preserved their independence. In 1900 there were in the Cherokee nation about 25,000 indians, 9000 negroes and 67,000 whites. These indians are refined and are in appearance scarcely distinguishable from the whites, among whom they now are classed as citizens of the United States. See FIVE CIVILIZED TRIBES.

Cher'ry, a common plum-like, small fruit, of which there are a great many varieties. The tree belongs to the same tribe as the plum and prune; in its native state it is ornamental, and several varieties are cultivated in shrubberies. The wood of the tree is fine-grained and beautiful and serves a valuable purpose in the manufacture of fine furniture as it will not warp and takes a fine polish. The bird cherry, black cherry and chokecherry all grow wild in the United States, but the cultivated cherries have been derived from European species. In the United States, Kansas led in the production of cherries in 1900, but Pennsylvania, Indiana and Michigan were not far behind. Cherries find a ready market in all large cities.

Cherry Lau'rel, the common name of an evergreen shrub, a native of Asia Minor, but now naturalized in America and common in shrubberies. It is commonly called laurel, but it must not be confounded with the sweet bay or other true species of laurel. The leaves yield an oil nearly identical with that from bitter almonds, but less dangerous to use.

Cherry Valley Massacre, a massacre perpetrated in the village of Cherry Valley in central New York, by 700 British, Tories and indians, December 10, 1778. The attack was made at night and without warning, and about fifty inhabitants were murdered, including women and children. This episode and that of the Wyoming Valley Massacre led to the expedition of General Sullivan through New York in the following year. See REVOLUTIONARY WAR.

Chersonesus, *kur so ne'sus,* a name applied by the ancient Greeks to several peninsulas; as, the Cimbrian Chersonesus, now Jutland; the Tauric Chersonesus, the peninsula formed by the Black Sea and the Sea of Azov, the modern Crimea; the Thracian Chersonesus, northwest of the Hellespont.

Cherubini, *ka roo be'ne,* MARIA LUIGI CARLO ZENOBIO SALVATORE (1760–1842), an Italian musician, born at Florence. He received his early musical instruction from his parents, but at nine began to study under eminent masters and soon showed a genius for composition. Before he was sixteen he had produced a creditable *Mass and Credo in D* and a *Te Deum* which is still often produced. His first opera appeared in 1780, but did not achieve special success. His fame first became general in 1805, when he went to Vienna to compose an opera for the New Imperial Opera House; that production, *Faniska*, won him many friends, notably Haydn and Beethoven. After 1809 he wrote almost exclusively sacred music. He made several visits to London, being appointed at one time composer to the king and at another superintendent of the king's chapel. In 1821 he became director of the Paris Conservatory, and during his administration of more than twenty years he brought it to a high standard of excellence. His work is notable for its dignity and artistic instrumentation. His masterpiece is the opera, *Les deux Journees.*

Chesapeake, THE, a vessel famous in the history of the American navy. She was built early in the nineteenth century and in 1807, under the command of Commodore James Barron, started across the Atlantic on a training cruise. She was overtaken and halted by the *Leopard*, a British frigate, whose purpose was to demand the return of British deserters who were alleged to be among the *Chesapeake's* crew.

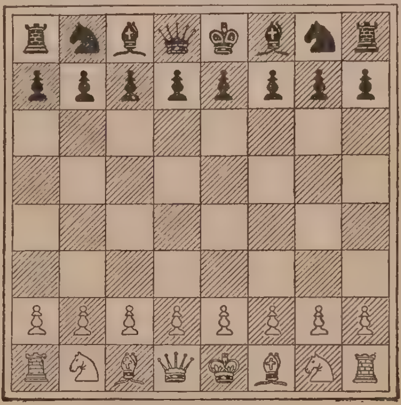
Barron refused to accede to this demand, and his vessel was attacked. After a brief but vigorous action the *Chesapeake* was forced to surrender, and four sailors were taken aboard the British vessel. The American government immediately demanded reparation from England, but none was forthcoming. This incident, which was known as the "*Chesapeake* affair," was one of the chief events which led to the War of 1812.

During the War of 1812, on June 1, 1813, the *Chesapeake*, commanded by Captain James Lawrence, fought a battle with the British vessel *Shannon* in Massachusetts Bay. Again the *Chesapeake* was forced to surrender, her captain being mortally wounded. During his last hours he encouraged his men with the cry, "Don't give up the ship," which has since been the motto of the American navy. The *Chesapeake* was taken to Halifax and afterwards was made into a British man-of-war, but was demolished in 1820.

Ches'apeake and Ohi'o Canal, a canal extending from Georgetown, D. C., to Cumberland, West Virginia. It is 184.5 miles long, sixty feet wide and six feet deep, and it has seventy-four locks, with a total lift of 609 feet. It was completed in 1850. This canal follows the course of the Potomac River and is chiefly used in the transportation of coal.

Chesapeake Bay, an arm of the Atlantic, entering the states of Virginia and Maryland and dividing the latter into two parts. Its length is 200 miles; its width is from 10 to 40 miles, and its depth is from 20 to 60 feet. The entrance between Cape Charles and Cape Henry is 12 miles wide. The coasts are irregular, and some of the largest inlets are estuaries of large rivers, such as the York, James, Potomac and Susquehanna. The bay is navigable its entire length for the largest steamers, and Norfolk and Baltimore are important ports for both inland and foreign trade. The bay is noted for its extensive oyster beds, and oyster farming is one of the leading industries of the locality.

Chess, a well-known game, of great antiquity and of Eastern origin, having probably arisen in India and thence spread through Persia and Arabia to Europe. The name itself, as well as many of the terms used in the game, are clearly of Eastern origin. The game is played by two persons on a *board*, which consists of sixty-four squares, arranged in eight rows of eight squares each, alternately black and white. Each player has sixteen men, eight of which, known as *pawns*, are of the lowest grade; the other eight, called *pieces*, are of various grades. They are, on each side, *king* and *queen*, two *bishops*, two *knights* and two *rooks*, or *castles*. The board must be placed so that each player shall have a white square at his right hand. The men are then set upon the two rows of squares next the players, the pieces on the first, the pawns on the second, row, leaving between the two sides four unoccupied rows. The king and queen occupy the central squares facing the corresponding pieces on the opposite side. The queen always occupies her own color, white queen on white square, black on black. The two bishops occupy the squares next the king and queen; the two knights the squares next the bishops; the castles, or rooks, the last, or corner, squares. The pawns fill the squares of the second, or front, row (See accompanying diagram). The men standing on the king's or queen's side of the board are named respectively king's and queen's men. Thus king's bishop or knight is the bishop or knight on the side of the king. The pawns are named from the pieces in front of which they stand; king's pawn, king's knight's pawn, queen's castle's pawn, etc. The names of the men are contracted as follows: King, K.; King's Bishop, K. B.; King's Knight, K. Kt.; King's Castle, K. C. or K. R.; Queen, Q.; Queen's Bishop, Q. B.; Queen's Knight, Q. Kt.; Queen's Castle, Q. C. or Q. R. The pawns are contracted: K. P., Q. P., K. B. P., Q. Kt. P., etc. The board is divided, inversely from the position of each player, into eight rows and eight files. Counting from White's right hand to his left, or from Black's left to his right, each file is named from the piece which



CHESS BOARD
Men in opening position.

occupies its first square, and counting inversely from the position of each player to that of the other, the rows are numbered from 1 to 8. At White's right-hand corner we have thus K. R. square; immediately above this K. R. 2; and so on to K. R. 8, which completes the file; the second file begins with K. Kt. square on the first row, and ends with K. Kt. 8 on the eighth. White's K. R. 8 and K. Kt. 8 are thus Black's K. R. square and K. Kt. square, and the moves of each player are described throughout from his own position, in inverse order to the moves of his opponent.

In chess a man captures by occupying the position of the captured man, which is removed from the board. The ordinary move of the *pawn* is straight forward in the same file; a P. never moves backward. The first time a pawn is moved it may be played forward one square or two; afterward only one square at a time. But in capturing an adverse piece the pawn moves diagonally to occupy the position of the captured man. When a pawn reaches the eighth row it can no longer remain a pawn, but must at once be exchanged for a piece. The player may choose any piece except the king, but the queen, the most valuable piece, is generally the piece chosen. This is called *queening a pawn,* and the player may thus have several queens on the board. The *rook,* or *castle,* moves in any direction and for any distance that is open, along either the particular row or the file on which it happens to stand. It can, of course, capture any obstructing man and occupy its place. The *bishop's* moves, like the castle's, are unlimited in range and are either backward or forward, but their direction is diagonal, and any bishop must always occupy squares of the same color. The *queen* combines the moves of the castle and the bishop. She is the most powerful piece on the board and can move in any direction or to any distance in a straight line. The *king* is at once the weakest and most valuable piece on the board. In point of direction he is as free as the queen, but for distance he is limited to the adjacent squares. Standing on any central square, he commands the eight squares around him, and no more. Besides his ordinary move the king has another by special privilege, in which the castle participates. Once in the game, if the squares between king and castle are clear, if neither king nor castle has moved, if the king is not attacked by any hostile man and if no hostile man commands the square over which the king has to pass, the king may move two squares towards either king's castle or queen's castle, and the castle at the same time may move to the square over which the king has passed. This is called *castling.* The *knight,* unlike the other pieces, never moves in a straight line. His move is limited to two squares at a time, one forward or backward, and one diagonally, and he can leap over any man occupying a square intermediate to that to which he intends to go. The knight, like the king, when on a central square commands eight squares, but they are at two squares' distance, and all in an oblique direction. All captures in chess are optional.

The definite aim in chess is the reduction to surrender of the opposing king. The king in chess is supposed to be inviolable; that is, he cannot be taken, he can only be in such a position that if it were any other piece it would be taken. Notice of every direct attack upon him must be given by the adversary saying "check" and when the king is attacked all other plans must be abandoned and all other men sacrificed, if necessary, to remove him from danger, cover the attack or capture the assailant. It is also a fundamental rule of the game that the king cannot be moved into check. When the king can no longer be defended on being checked by the adversary, either by moving him out of danger, or by interposing or by capture, the game is lost, and the adversary announces this by saying "checkmate." When, by inadvertence or want of skill, the player having the superior force blocks up his opponent's king so that he cannot move without going into check, and no other man can be moved without exposing him, the player, reduced to this extremity, cannot play at all. In such a case, the one player being unable to play and the other being out of turn, the king is *stalemated* and the game is considered *drawn,* that is, concluded without advantage to either player. The laws of the game must be sought in some special manual, such as Staunton's *Chess Praxis*; more modern works of value are Staunton's *Chess: Theory and Practice* and Gossip's *Chess Player's Manual.*

Chest or **Tho'rax,** the cavity of the human body which lies between the neck and the abdomen. It is bounded by the ribs, sternum and diaphragm and that portion of the spinal column to which the ribs are attached. It is conical in shape, with the apex upward, and contains the heart, lungs, great arteries, veins and nerves, the trachea, bronchi, oesophagus and thoracic duct. The organs of the chest are subject to many diseases, some of which are frequently fatal. Those diseases most to be dreaded are diseases of the heart, and asthma, consumption, bronchitis and pneumonia.

Ches'ter, a city and river port of England, capital of Cheshire, on the right bank of the Dee, 16 mi. s. e. of Liverpool. It is one of the oldest cities of England and still has many traces of early periods. There are around the city ancient walls of sandstone, which surround it for a circuit of 2 miles, forming beautiful promenades. The streets, which were hewn out of rock by the Romans at a depth of from 4 to 10 feet, are a very interesting feature of the town; they are called *rows*. Among the chief buildings are the Chester Cathedral, a beautiful Norman Gothic structure, several other churches and a portion of a castle founded by William the Conqueror. The River Dee is here crossed by three bridges, the most noteworthy of which is Grosvenor Bridge, a splendid stone structure 200 feet in length. The chief manufactures are lead, chemical works and iron products, and there is also a shipbuilding yard. The principal trade, however, is in cheese, for which Chester is especially celebrated. Population in 1910, 36,281.

Chester, Pa., a city in Delaware co., 14 mi. s. w. of Philadelphia, on the Delaware River and on the Pennsylvania, the Baltimore & Ohio and the Philadelphia & Reading railroads. It is one of the oldest towns in Pennsylvania, having been settled by the Swedes as early as 1644. It was called Upland until, in 1682, William Penn gave it its present name. The first Pennsylvania assembly met here in 1632, and during the Revolution the city was held alternately by the British and American troops. The Pennsylvania Military College and the Crozer Theological Seminary are located here. The manufactures include cotton and woolen goods, dye stuffs and iron, steel and lumber products. Population in 1910, 38,537.

Ches'terfield, a town of Derbyshire, England, 12 mi. s. of Sheffield. The principal manufactures are ginghams, lace and earthenware, but a majority of the working classes are employed in connection with the collieries, iron mines and blast furnaces of the vicinity. The town received its first charter during the reign of King John. Population in 1901, 27,185.

Chesterfield, Philip Dormer Stanhope, Earl of (1694–1773), an English statesman and author. He succeeded his father in the title in 1726, sat in the House of Lords and acquired some distinction as a speaker. In 1728 he was ambassador to Holland, in 1744 lord lieutenant of Ireland, a position which he occupied with great credit, and in 1746, secretary of state. Two years later, however, he retired from public affairs. His letters to his son, written to form the manners of the young man, combine wit and good sense with great knowledge of society.

Chestnut, *ches'nut,* a genus of plants, allied to the beech. The *common*, or *Spanish, chestnut* is a stately tree, with large, handsome, dark green leaves. The fruit consists of two or more seeds, enveloped in a prickly husk. Probably a native of Asia Minor, it has long been naturalized in Europe and was perhaps introduced into Britain by the Romans. The tree grows freely in the United States and may reach the age of many centuries. Chestnuts form a stable article of food among the peasants of Spain and Italy. The timber of the tree was formerly more in use than it is now. It is inferior to that of the oak, though very similar to it in appearance, especially when old. Two American species of chestnuts have edible fruits. One is often regarded as identical with the European tree. The name of *cape chestnut* is given to a beautiful tree of the rue family, a native of Cape Colony. The horse-chestnut is quite a different tree from the common chestnut. See Horse-chestnut.

Chev'iot Hills, a range of low mountains which extends between Scotland and England for about 35 miles, located principally in the counties of Northumberland and Roxborough. Their highest point is Cheviot Peak, 2688 feet. Along these hills were fought many battles between the English and Scotch before the two kingdoms were united.

Cheyenne, *shi en'* or *she en'* (red), a brave and manly tribe of plains indians of Algonquian stock. Originally they were agriculturists, living in settled villages, but when they obtained horses they became expert riders and gave up their settled habitations. It would seem that so intelligent and powerful a race might have been civilized, if decently treated, but they became the fiercest enemies of the whites, and the terrible cost of subduing them can never be estimated. Now about 1200 are living peacefully on a reservation in Arizona, while about 2000 more are living among the whites in Oklahoma.

Cheyenne, Wyo., the capital of the state and the county-seat of Laramie co., about 100 mi. n. of Denver, Colo., on the Union Pacific, the Chicago, Burlington & Quincy, and the Colorado & Southern railroads. It is located on a plateau more than 6000 feet above the sea. The city has several noteworthy buildings, among which are the state capitol, the Federal building and a Carnegie library. The State Soldiers' Home is located here, and Fort Russell, a United States military post, is about three miles distant. There is an important trade in cattle and sheep and in supplies for a large Rocky Mountain region. Cheyenne was settled in 1867 and was made the capital in 1869. Population in 1910, 11,320.

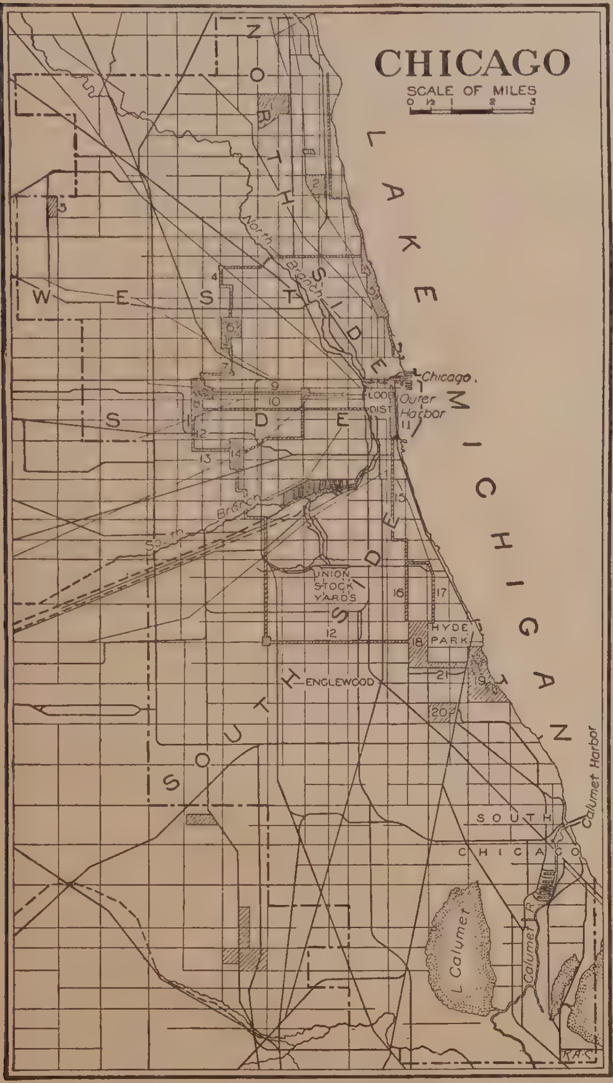
Chiaroscuro, *kyah ro skoo'ro*, the art of distributing light and shade correctly in a picture, or the combined effect of light, shade and reflection. Unless light and shade are properly brought out in a picture, the volume cannot be shown and the picture is hard and unreal. The painter not only must know where the lights and shadows should be placed, but he must understand perspective and know the force of colors, in order to produce real effects. Painters still fail in producing the right effect, and before the time of Raphael this was due to the lack of knowledge of chiaroscuro. Rembrandt was a master of the art and handled light and shade in such a manner as to give his objects wonderful realism.

Chica, *che'kah*, a kind of beer made from maize, in general use in Chile, Peru and elsewhere in the mountainous regions of South America. See Brewing.

Chicago, *she kaw'go*, Ill., county-seat of Cook co., and the second largest city in the United States, situated at the head of Lake Michigan. 2417 mi. from the Pacific coast, 911 mi. from New York, 811 mi. from Washington and 915 mi. from New Orleans, and on more than thirty lines of railway. The city is built on a level plain, but a few feet above the lake, and extends north and south along the lake front for 24 miles. Its greatest width is about 10½ miles, and its area a little over 190 square miles. The Chicago River, which is formed by north and south branches, enters the lake nearly midway between the northern and southern extremities of the city. The river and its branches divide the city into three well-recognized districts, legally known as the South Side, the West Side and the North Side. The South Side includes that portion of the city south and east of the river; the North Side, that portion north of the river and east of the north branch, while the West Side includes all west of the rivers. The most important business section is in the northern portion of the South Side, extending from the river to Twelfth Street. Within this area are crowded many of the large buildings, most of the great railway stations and the most important wholesale and retail stores. Along the river on the West Side are numerous freight depots, warehouses and manufactories, while immediately west of these are smaller retail stores and manufacturing establishments, and beyond these, residences. The southern portion of the North Side contains some manufactories and warehouses, but the greater portion of this division is used for residences.

Streets and Transportation. The streets of the city are regularly laid out; and they run usually north and south and east and west. Some of them, such as Western Avenue and Halsted Street, extend nearly the entire length of the city. In general the streets are broad, and the building line has been strictly observed through their entire length. A uniform system of numbering throughout the city enables one to find any point without difficulty. Madison, extending east and west, and State Street, extending north and south, are taken as the base lines and divide the streets crossing them into north and south and east and west. North and south streets are numbered from Madison, and east and west streets are numbered from the lake shore. There are 800 numbers to the mile, so the number tells the location and the distance from the base line. All sections of the city are connected with the business center by modern electric lines, and the North, West and South sides have elevated roads. In all, the surface lines of the city have over 1265 miles of single track, and the elevated lines exceed 106 miles. The surface lines connect with the North and West sides through three tunnels under the river and by numerous bridges. The elevated lines form a loop which encircles the center of the business district and around which all elevated trains pass. The average number of people carried upon all lines daily is over 1,360,000.

Sewage Disposal and Water Supply. The city is provided with an excellent sewage system, which, through the completion of the Chicago Drainage Canal, finds an outlet through the Illinois River into the Mississippi (See Drainage Canal, Chicago). The water supply comes from Lake Michigan and is obtained through a number of tunnels, which have been extended under the lake bottom from two to four miles from the shore, where the intakes, or cribs, are located. These tunnels, have been constructed at distances of from four to six miles from one another, as the needs of the city required. The water is pumped from the lake and forced through mains to all parts of the city.



1, Rose Hill Cemetery. 2, Graceland Cemetery. 3, Mount Olive Cemetery. 4, Humboldt Boulevard 5, Lincoln Park. 6, Humboldt Park. 7, Central Park Boulevard. 8, Garfield Park. 9, Washington Boulevard. 10, Jackson Boulevard. 11, Grant Park. 12 Garfield Boulevard. 13, Douglas Boulevard. 14, Douglas Park. 15, Michigan Boulevard. 16, Grand Boulevard. 17, Drexel Boulevard. 18, Washington Park. 19, Jackson Park. 20, Oakwoods Cemetery. 21, Midway Plaisance.

Parks and Boulevards. The park system of Chicago includes over 3530 acres and is under the control of four boards of commissioners, the members of two of them being appointed by the governor of Illinois. The most important park on the South Side is Jackson Park, the former site of the World's Columbian Exposition, which has an area of 524 acres. This extends along the lake front and is the largest park in the city. It contains the Field Columbian Museum, numerous canals, lagoons and driveways. North and west of Jackson Park is Washington Park, noted for its beautiful landscape gardening and floral displays during the summer. Other parks connected with the south park system are Grant, consisting partly of made land, Douglas, Garfield, Humboldt and Marquette. On the North Side, extending along the lake shore for over a mile, is Lincoln Park, the oldest and most famous park in the city. Lincoln Park is noted for its very complete zoölogical collection, its conservatory of tropical plants, its floral gardens and its statues and monuments. Among the most noted of the latter are the Lincoln Monument, containing the statue of Lincoln, by Saint Gaudens; the Grant Equestrian Statue; the statues of La Salle, Linnaeus, Shakespeare, Benjamin Franklin and Hans Christian Andersen. The park also contains a bust of Beethoven and statues of Garibaldi and Goethe. On the west border of the park, in front of Center Street, is located the Academy of Sciences, which contains a valuable museum of natural history. Other monuments in the city are the equestrian statue of General Logan in Grant Park; the Douglas Monument and Mausoleum in Monument Square; the Confederate Monument in Oakwoods Cemetery; the Humboldt Monument in Humboldt Park, and the Police Monument in Union Park, in memory of the victims of the anarchist riot in 1886.

The entire park system of Chicago is connected by boulevards. The most important of these are Michigan, Drexel, Garfield, Jackson, Washington and Sheridan Road, which extends nearly 24 miles, to Fort Sheridan. In all, the city has over 70 miles of boulevards. Most of these are lined with beautiful residences, and some of them, like Drexel and Garfield, contain central plots decorated with shade trees and flowers. The boulevard system of Chicago is considered the most extensive and complete in America.

Public Buildings. Foremost among the public buildings is the City Hall and Cook County building, combined in one structure and occupying the square bounded by Randolph, Clark, Washington and La Salle streets. It is of granite and ornamented on each side by a row of magnificent Corinthian columns. About the main entrance are figures in bas relief illustrating state and national history. The building cost $7,000,000 and is one of the finest public edifices in America. It contains the administrative offices of the county and city. Next in importance is the Federal building, occupying the square bounded by Adams, Dearborn, Jackson and Clark streets. This is a granite structure surmounted by an immense dome, and completed at an expense of $5,000,000. It contains the postoffice, custom house offices, a branch of the United States Treasury and other governmental offices. Other prominent buildings in the business district are the Masonic Temple, the Monadnock, the Manhattan, the First National Bank, the American Trust and Savings Bank, the Continental and Commercial Bank, the Illinois Trust Bank, the Railway Exchange, the new McCormick, the building of the Gas, Light and Coke Company, the Karpen, the wholesale and retail stores of Marshall Field & Company and the Auditorium, a massive granite structure containing a large hotel, a theater with a seating capacity of about 4000 and many offices. A central tower rises to the height of 225 feet, and from it an excellent view of the city and lake can be obtained.

The leading hotels in the business district are the Congress, the Blackstone, the Auditorium, the La Salle, the Sherman, the Palmer House, the Great Northern and the Grand Pacific. The Metropole and the Chicago Beach Hotel on the south side and the Virginia on the north side are family hotels having a national reputation. The leading theaters are the Auditorium, the Blackstone, the Studebaker, the Illinois, the Colonial, Powers, the Garrick, the Majestic, the Lyric and the Grand Opera House. To the list of amusement halls should be added the Chicago Orchestra building, which was erected especially for use by that organization, and the Coliseum, an immense structure used for exhibitions and political conventions.

Among the important churches are the Cathedral of the Holy Name, the Second Presbyterian, the Cathedral of Saint Peter and Saint Paul, the Church of Christ, the Church of the Redeemer, the First Unitarian and Saint James Methodist.

Libraries Chicago has three large libraries and a number of smaller ones. The Public Library, on Michigan Avenue, is housed in one of the finest and most complete library buildings in the country. The interior is finished in Sienna and Carrara marble and glass mosaic and is remarkable for the beauty of its design. At the north end of the building is Grand Army Hall, finished in verde antique and containing in stone mosaic the badges of all the different army corps. The library contains nearly 400,000 volumes and besides the station at the central building, it maintains stations at the small parks and in various other localities in all parts of the city. These stations make the Public Library easily accessible to all. The Newberry Library occupies a magnificent granite building at Clark Street and Walton Place on the north side. It was established by the will of Walter S. Newberry, who bequeathed over $2,000,000 for the purpose. It contains about 200,000 volumes and is especially valuable for its works on history, literature and philosophy. The John Crerar Library has quarters on Wabash Avenue, but will ultimately occupy its own building. It contains over 275,000 volumes and specializes in the natural sciences, industries, medical research and the social and economic sciences. It has an endowment of $2,500,000 and affords opportunity for a wide range of study. This and the Newberry are reference libraries and are free to all who wish to consult them, but books cannot be taken away. The Chicago Historical Society has a valuable library of history. There is also a good library in the Lewis Institute. Besides these there are a number of law and medical libraries maintained by private organizations, which are open to members. The University of Chicago maintains a library of about 400,000 volumes, which is primarily for the use of the students and faculty of the University, but may be consulted by the public on payment of a small fee.

Education. Chicago maintains an elaborate and complete system of public schools, ranging from the kindergarten to the Chicago Normal School. There are sixteen high schools and 250 elementary schools. There are over 6000 teachers and the annual enrollment approximates 300,000. Among the higher institutions of learning are the University of Chicago, located on the Midway Plaisance, near Jackson Park; Northwestern University, which has its law, dental and medical schools within the city limits; Armour Institute; Lewis Institute; Saint Ignatius College, and Y. M. C. A. Institute. Among the special institutions worthy of note are the Chicago Musical College and the Art Institute. The latter occupies a magnificent building at the foot of Adams Street and contains an extended collection of paintings, statuary and antiquities, an art library, a lecture hall and a large number of classrooms. This institution enrolls from 1200 to 1500 students each year.

INSTITUTIONS. The city contains hundreds of churches; a large number of hospitals, the most noted among which are the Cook County Hospital, Saint Luke's, Mercy, the Presbyterian, the Alexian Brothers' and Wesley. The best known of the social settlements is Hull House, situated in the center of the Ghetto district on the West Side and famous throughout the world for its original methods and its success. Other settlements which have also obtained a wide reputation are Chicago Commons, Chicago University Settlement and Northwestern University Settlement. The United Charities and the Bureau of Hebrew Charities maintain a corps of trained inspectors and workers, who give their entire time to the needs of the poor and the unfortunate and see that charity is properly and worthily bestowed. These are among the most important organizations in the city.

COMMERCE AND INDUSTRY. Chicago is the industrial and commercial center of the West and the greatest railroad center and live stock market in the world. It is also one of the greatest inland ports. Railroad lines whose mileage includes nearly one-third of that of the United States and one-twentieth of the railway mileage of the world terminate in the city. The passenger service is accommodated in six large and well-appointed stations, four of which are within the down-town district. All railway lines maintain extensive freight depots in various parts of the city, and by means of a belt line all railroads are so connected as to form a complete transfer system. An electric freight transfer railroad service is now in operation through about sixty miles of tunnels beneath the city. The Chicago River and its branches contain miles of docks, on many of which are large grain elevators. The lake traffic consists of corn, wheat, lumber and coal. Lines of freight and passenger steamers connect with all important lake ports, and through the canals and the Saint Lawrence River the city has direct communication with the Atlantic Ocean.

The location of Chicago as a distributing center and its proximity to the immense coal fields of Illinois have made it an important manufacturing center. The city has over 20,000 manufacturing establishments, which employ nearly 300,000 workmen. The largest of these industries is meat-packing and slaughtering, the location of which is in the stockyards district, between Thirty-ninth and Forty-third streets, on the South Side. Here are found the largest meat-packing houses in the world (See MEAT-PACKING). Next to the meat-packing industry in importance are the manufacture of foundry and machine shop products, iron and steel, clothing, agricultural implements and printing and publishing. The manufacture of agricultural implements centers in the immense establishments of the International Harvester Company, the McCormick Harvester Works and the Deering Harvester Works. The wholesale trade is very extensive. The largest wholesale establishments are on Fifth Avenue, Franklin and Market streets. The city is also noted for its immense retail stores. That of Marshall Field & Company, occupying nearly the entire block bounded by Randolph, State and Washington streets and Wabash Avenue, has a floor surface of over 30 acres and is the largest retail store in the world. Other large retail stores worthy of mention are the Fair; Carson, Pirie, Scott & Company's; Mandel Brothers', and that of Siegel, Cooper & Company. In extent and value of its commerce, Chicago ranks second only to New York.

HISTORY. The site of Chicago was first visited by white men, Marquette and Joliet, in 1673. The first settler came in 1679. Fort Dearborn was built in 1804, but was evacuated on the occasion of the indian massacre in 1812. The city was organized in 1835, with a population of 3265. The Illinois and Michigan canal, begun in 1836, was finished in 1848. The first railroad, the Chicago & Galena, now a division of the Chicago & Northwestern, was completed in 1848. In 1871 occurred the great fire, which practically destroyed the business district. This was rapidly rebuilt on the present scale of magnificence. The principal events since the fire have been the anarchist riot in 1886, the World's Columbian Exposition in 1893 and the great railway strike in 1894. The Chicago Drainage Canal, begun in 1892, was opened in 1900 No other city in the world has increased in population and wealth as rapidly as Chicago.

Population. The population in 1900 was 1,698,575. In 1910 it was 2,185,283. Consult Winchell's *A Civic Manual of Chicago and Cook County*, and Kirkland's *History of Chicago.*

Chicago, University of, a university located at Chicago, Ill., the outgrowth of a school of collegiate degree founded in 1857. The original university suspended in 1886 for want of funds, and the present institution is the result of efforts begun by the American Baptist Educational Society a short time after. The present university was chartered in 1890 and embraces five departments: (1) schools and colleges; (2) libraries, laboratories and museums; (3) university extension; (4) the university press; (5) the university affiliated schools.

In the arrangement of its terms the university of Chicago is different from other American universities. Instead of the traditional school year of nine months, the work of the year is divided into four quarters of twelve weeks each, and each quarter is divided into two terms of six weeks. The work is arranged by terms, and students may be absent any term or any quarter without loss of school time, since on their return they can enter classes taking up work where it was dropped when their vacation began. The schools and colleges are organized into junior and senior departments. The junior colleges contain courses of study corresponding to those of freshmen and sophomore years in most colleges; the senior colleges correspond to the work in the junior and senior years, and in them the courses of study are almost entirely elective. Graduate work is provided in all departments, and for this the university is especially well fitted. The university extension division carries on extension work by means of lecture courses connected with study classes, and by correspondence work, through which a part of nearly every course in the university may be taken. It also assists this work by sending traveling libraries to centers where lecture courses are maintained. The growth and equipment of the university are largely due to the bequests of Mr. John D. Rockefeller, who since its foundation has bequeathed to the institution over ten million dollars. The University Press publishes the *Journal of Political Economy*, the *American Journal of Sociology*, the *Biblical World*, the *American Journal of Theology*, the *Astro-Physical Journal*, the *Journal of Geology*, the *School Review*, the *Elementary Teacher*, the *University Record* and a number of other scientific periodicals. The library numbers about 475,000 volumes, and the yearly enrollment of the university, including men and women, is over 5000.

Chick'adee. See Titmouse.

Chickahom'iny, a river of Virginia, that rises about 20 miles northwest of Richmond and flows southwesterly till it joins the James. The stream is not large, but it is noted for the numerous battles that occurred on or near its banks during McClellan's and Grant's campaigns against Richmond in the Civil War. The most important of these engagements were Mechanicsville, Williamsburg, Seven Pines, Gaines's Mill and the Battles of Cold Harbor. See Peninsula Campaign; Cold Harbor, Battles of.

Chickamau'ga, Battle of, an important and bloody battle of the Civil War, fought September 19 and 20, 1863, between a Federal force of 55,000 under General Rosecrans and a Confederate army of 70,000 under General Braxton Bragg. Rosecrans approached Chattanooga, and Bragg, fearing that he would be besieged, retreated southward until he received reënforcements. The retreat was halted at Chickamauga, and Bragg prepared for battle, Rosecrans taking up a defensive position along Chickamauga Creek. On September 19 General Polk crossed the river and struck the Federal left wing under Thomas, but the latter repulsed the assault, inflicting a terrible loss. On the following day the same position was again attacked without effect, but a misunderstanding of orders caused a breach in another part of the Federal line, and a concentrated attack by the Confederates caused all but Thomas's division to flee from the field. Thomas continued to grapple with his opponent, until he was summarily ordered to retreat. It was during this battle that he earned his sobriquet of the "Rock of Chickamauga."

Chick'asaw, a once powerful tribe of indians living in northern Mississippi and Tennessee. In 1540 De Soto reached one of their villages and, attempting to compel service from them, was attacked. The Chickasaw were always hostile to the French, but formed a friendship with the English. Their relations with the

United States were usually friendly, and in 1834 they gave up their lands, receiving nearly four million dollars in payment. With this they bought land from the Choctaw, in the extreme western part of the Indian Territory, where they finally were recognized as the Chickasaw nation, under their own government. They were slaveholders and naturally sided with the South, but they submitted to the freeing of their slaves after the war. In 1900 their nation contained about 6000 indians, 9000 negroes and more than 120,000 whites. See FIVE CIVILIZED TRIBES.

Chickasha, OKLA., the county-seat of Grady co., is situated 39 mi. s. w. of Oklahoma City, in the fertile valley of the Washita River, on the main lines of the Frisco and Chicago, Rock Island & Pacific railroads and branches. Chickasha is in the heart of the richest farm lands of Oklahoma, on which corn, cotton, wheat, oats, alfalfa and other staple crops are raised, the most important of these being corn and cotton. Chickasha has paved streets, electric lights, mills, a cotton compress and beautiful buildings. It is one of the largest shipping points for cattle and hogs in the state. The state industrial school for girls is located here. Population in 1910, 10,320.

Chico, *che'ko*, a city, formerly the capital, of Butte co., Cal., situated on Chico Creek and on the Southern Pacific railroad. The city has seven churches, a public library and a normal school. There are also several flour mills, lumber mills, machine shops and a foundry. Population in 1900, 2640.

Chic'opee, MASS., a city in Hampden co., 3 mi. n. of Springfield, on the Connecticut River and on the Boston & Maine and several electric railroads. The river affords water power for various manufactures, including firearms, cotton and knit goods, bicycles, machinery, agricultural implements and other articles. Chicopee was settled about 1675 and was incorporated as a town in 1848. It includes the villages of Chicopee Falls, Fairview and Willimansett and became a city in 1890. Population in 1910, 25,401.

Chic'ory or **Suc'cory,** a plant, native of Europe and Asia, but long since naturalized in the United States. It has a fleshy root, spreading branches, coarse leaves and bright blue flowers. The leaves are sometimes blanched, to be used as salad. But the most important part of the plant is its long, fleshy and milky root, which, when dried, roasted and ground, is now extensively used for adulterating coffee. Its presence may easily be detected by putting a spoonful of the mixture into a glass of clear, cold water, when the coffee will float on the surface and the chicory will separate and discolor the water as it subsides.

Chihuahua, *che wah'wah*, a city of Mexico, capital of the state of the same name, is situated on the Mexican Central railway, 750 mi. n. of Mexico and 225 mi. s. of El Paso, Texas. It is generally well built and is supplied with water by a notable aqueduct. The industries include iron foundries, machine shops, the manufacture of cotton and woolen goods, carpets, beer and other articles. The city is in the midst of a rich mining section and has a large trade, being the leading commercial center in this part of Mexico. Chihuahua was founded in 1539. Population in 1900, 30,405.

Chil'blain, a small, oval or round patch of red and loose skin, appearing on the foot or sometimes on the face, as a result of inflammation, caused by exposure to cold or frost. The inflammation is accompanied by stinging, itching and burning sensations and some soreness. It is probable that tight shoes and moist socks tend to induce the frostbite. Chilblains are not different from freezing, except in degree. See FROSTBITE.

Child, LYDIA MARIA FRANCIS (1802–1880), an American author, born in Medford, Mass. She taught for one year in a seminary in her native town and kept a private school in Watertown from 1824 till 1828, when she was married to David Lee Child. She early became interested in the antislavery movement and published *An Appeal to that Class of Americans Called Africans*, which was the first antislavery work printed in America in book form. In 1841 she removed to New York, where she was editor of the *National Antislavery Standard*. She contributed largely to aid the Union soldiers during the Civil War, and afterward she helped the freedmen and gave lavishly for the support of schools for the negroes. Perhaps her best work was the tale, *Philothea*.

Chil'dren, SOCIETIES FOR, societies organized for the purpose of caring for children who are dependent, or whose parents are unable to care for them. The most important of these organizations are the Society for the Prevention of Cruelty to Children and the Humane Association. The first organization was established in New York in 1875, and similar organizations were soon started in other large cities of the country. The purpose is to shield children from immoral influences, to save them from inhuman treatment and neglect and, especially, to prevent their being sentenced by courts in large cities to confinement with professional criminals. The work of the Humane Association is given largely to finding homes for dependent children and for those whose parents are unable to care for them. There are also homes for defective children, such as those who are crippled, the deaf, dumb and feeble-minded, which are maintained by these associations. With few exceptions societies for children are established and maintained by churches or other organizations banded together for philanthropic purposes, but their influence has been such as to secure in some states a measure of support from state funds, and they have also been instrumental in nearly all states in securing legislation which has prevented many abuses.

Childs, George William (1829–1894), an American publisher and philanthropist. He was born in Baltimore, served for a time in the navy and later entered private business. He was long identified with the *Philadelphia Ledger,* one of the first cheap newspapers, was a heavy contributor to charities, erected many monuments to celebrities and educated more than 800 boys and girls. In 1890 he published his *Recollections.*

Child Study, an educational movement for the scientific study of children. Child study is closely related to the biological sciences (See Biology) and is the direct outgrowth of physiology and psychology (See Psychology). Experimental and physiological psychology revealed the close connection of mind and body and showed that mental progress depended upon physical development. This led to more systematic study of the physical development of the child. The child's mental powers have also been carefully studied, and child psychology has become a branch of general psychology. Under the influence and direction of eminent German psychologists and teachers, child study first began to attract attention, and it is in Germany that this line of educational work has been brought to the highest stage of development. Child study is also systematically pursued in Great Britain and other European countries.

The movement became established in the United States in 1880, and by the close of the century it was thoroughly incorporated into the educational systems of the various states. Departments of education in universities provide for training teachers and specialists in this line of research. Many state normal schools make provision for child study in their courses, and some of the largest cities employ specialists who devote their entire time to instructing teachers and to the study of children. The National Educational Association and nearly all state teachers' associations now have departments of child study, which hold special sessions in connection with the annual meetings of these associations. At the meetings of these departments, questions and problems connected with the child's development are discussed. In addition to these organizations, women's clubs and other organizations are also engaged in some phases of the work.

In its most advanced stages, child study has become specialized and exacting. Its successful prosecution requires delicate apparatus and trained experts. Much of the work is along lines of original research and has for its purpose the discovery of facts and principles which will form a foundation for the care and training of children. This phase of the work can be carried on only in institutions especially prepared for it, such as schools of education connected with universities and the best equipped normal schools. The rate of growth of children is determined by measurement at different periods and for different months in the year. The growth of different organs, the relation of age to development in the sexes, the determination of the condition of the heart, blood vessels and nervous system at different periods, and the changes, physical and mental, which take place during the period of adolescence, are carefully noted.

There is, however, a more general line of child study and one in which both teachers and parents can participate. This does not require special apparatus nor technical training, though the latter is of great assistance. This line of study is confined to the careful observation of the child. Its purposes are to determine the development of the senses, to discover the child's interests, his strength and his endurance and to understand his physical and mental conditions. Careful observation leads almost every teacher to discover among her pupils those who are defective in sight or hearing. Because of such defects children often appear dull. If seated where they can have the best advantages for seeing or hearing, these pupils will ordinarily do the required work as well as the others in the class.

Children's dispositions, likes and dislikes, ability to apply themselves and other tendencies can best be studied in the home, and in ascertaining these facts the mother can coöperate with the teacher. The period of adolescence is often the most critical period in the child's life. It begins at about fourteen and continues until about twenty-four in males and twenty-two in females, the changes being more marked in the first two or three years of the period and varying in the degree of manifestation in different individuals. During this period both the boy and the girl need sympathy and encouragement. Because of failure to understand the child's condition at this time, both parents and teachers often err in their management.

The results of the study of the child's mental development are seen in the radical changes which have taken place in the courses of study. Subjects which appeal to the child's interests at different periods of his development have taken the place of those which were dogmatic and abstract. Occupations for the hands, in the form of kindergarten plays, busy work and manual training, are now found in all well-systematized schools and assist in securing the development of all the child's powers. Methods of discipline have also been greatly modified for the better. Children are now led to control themselves, and cases of cruel and severe punishment seldom occur.

See Kindergarten; Manual Training; Pedagogics; Psychology. Consult Taylor's *The Study of the Child*; Baldwin's *Mental Development*, and Preyer's *Mental Development in the Child*.

Chile, *che'la*, or **Chili**, *che'le*, a country of South America, extending along the Pacific coast from latitude 18° south nearly to Cape Horn. It is bounded on the n. by Peru; on the n. e. and e. by Bolivia and Argentine Republic. It is 2700 mi. long, and its extreme width is 250 mi. The republic is divided into 23 provinces and 1 territory and has an area of about 307,620 sq. mi., equal to the combined areas of Texas and Maine.

Surface and Drainage. The southern portion is mountainous and is covered with heavy forests, and it is notable for a large number of coast islands and for deep fiords which enter the continental plain. The Andes form the easthern boundary—an unbroken wall, averaging 6000 feet in height in the south and 15,000 feet in height in the north. Among the loftiest summits, the greater number of which are extinct volcanoes, are Tupungato, 23,000 feet; Cerro del Mercedario, 22,000 feet; Antofalla, 20,900 feet, and Aconcagua, whose base is partly in Chile, with a summit of 23,080 feet, in Argentine Republic. The Chilean Andes are more heavily clad in snow than any other part of the range, and there are many glaciers, especially in the south. North of latitude 33° there is no rainfall for years at a time, and there are large deserts, among them being Atacama and Tarapaca. The region in the central part of Chile is well watered and fertile and is adapted to grazing and the cultivation of grain. The rivers of Chile are directed westward across the country. There are none of great size, the largest and the longest, the Bio Bio, having a length of 200 miles.

Mineral Resources. Chile is one of the chief mineral-producing countries of South America. The most important mineral product is nitrate of soda, which occurs in large beds in the northern deserts. The deposits yield an annual product of about 1,300,000 tons and give employment to over 24,000 men. Gold is obtained chiefly from the river sands, but the yield is not very great, being less than the silver product. Copper ores, next to the nitrates, are the most important mineral resources of the country. Cobalt and nickel are also mined, and zinc, iron, mercury and alabaster are found in small quantities.

Climate. The climate of Chile is exceedingly varied. In the north the climate is sub-tropical; that of the central valley is healthful and pleasant; in the southern portion the climate is exceedingly wet, some regions being too wet for the growth of cereals.

Agriculture. The agricultural activities of Chile are mostly restricted to the great central valley. It is estimated that about one-half of the population is engaged in agricultural pursuits, but an obstacle to the development of the farming resources of the country is the rapid development of nitrate mining, which gives employment to so many of the inhabitants. The most important crops are wheat, maize and barley. Next to cereals, the most important agricultural industry is grape raising. Industrial plants, such as flax, hemp and tobacco, are also cultivated to some extent. Live stock and alfalfa are exported from the north; potatoes, flax, barley, honey, fruit and wheat from the central part, and timber, potatoes and apples from the southern portion. The principal timber tree is a tree called the cedar, and other important trees are the Araucanian pine, the beech, the evergreen and the quillaya, the bark of which is of considerable commercial importance. Cattle-raising has recently made rapid progress. Sheep and goats are very numerous and thrive especially in the central region.

Manufactures. The manufactures are not very extensive. They include the smelting of ores, the production of glass, leather, soap and sugar. Agriculture and stock-raising are the chief pursuits.

Transportation. There are two lines of British and German steamers which sail for Europe through the Strait of Magellan every two weeks, besides a weekly steamer to Panama and many coasting steamers. In regard to transportation, Chile stands in the front rank among the South American countries. The first railway line was opened in 1852, but the construction of railroads on a large scale was not begun until 1888. In 1900 the total length of railways in operation was about 2880 miles, of which 1353 miles were operated by the State. Many new railway lines are being projected. The most important of those recently completed is the one connecting Valparaiso with Buenos Ayres in Argentina. The shipping of the Chilean ports exceeds that of any other country in South America.

Inhabitants. The representatives of the aboriginal people of Chile are of the race commonly known as the Araucanian, distinguished by its endurance, valor and courage. The educated classes consist almost entirely of the descendants of the Spanish conquerors, and these have preserved the language, religion and social customs of Spain. Many of the inhabitants represent a mixture of European, indian and negro blood.

Education. Public instruction, though provided by the State, is yet in an unsatisfactory condition. Secondary instruction is also offered. The state university at Santiago gives courses in law and political science, medicine, pharmacy and fine arts, and there are, besides these, schools of agriculture, mining and other technical institutions, normal schools and military and naval academies.

Government and Religion. The executive power is vested in a president, who is elected for five years by electors chosen by popular vote. He is aided by a cabinet of six ministers, who are in charge of the seven departments of government, and also by a council of state of eleven members, five of whom are nominated by him and six by congress. The legislature consists of a Senate and a Chamber of Deputies, the former elected for six years and the latter for three. The Roman Catholic Church is sustained at public cost, but other churches are tolerated. The priests possess an immense influence over the people, who look to them for aid in politics as well as in religion.

Cities. The chief cities of Chile are Santiago, the capital, Valparaiso, Concepcion, Talca, Iquique, Valdivia, Copiapo and Coquimbo, each of which is described under its title.

History. In 1541 the conquest of northern Chile from the Incas of Peru was begun by Valdivia, who was successful in 1550. The Araucanians in southern Chile kept up the struggle for two hundred years and were never wholly subdued. In 1810 Chile revolted against Spain and was successful, with the aid of General San Martin, in gaining independence, which was proclaimed in 1818 and formally recognized by a treaty with Spain in 1844. In 1865 Chile and Peru were engaged in war with Spain, which latsed four years. In the war with Peru and Bolivia fourteen years later, Chile was successful and added to her territory the territories of Antafagasta and Tarapaca. There have been a few revolutions since, but none of lasting character; Chile has followed its development peacefully, and a democratic spirit prevails. Population, 3,500,000.

Chil′licoth′e, Ohio, the county-seat of Ross co., 50 mi. s. of Columbus, on the Ohio & Erie canal, the Scioto River and on the Baltimore & Ohio, the Southwestern, the Norfolk & Western and the Cincinnati, Hamilton & Dayton railroads. The city was settled in 1796 and was the capital of Ohio from 1800 to 1810. The valley is a rich agricultural district and has extensive coal mines. The industrial establishments are railroad shops and manufactures of wagons, engines, tools and shoes. Population in 1910, 14,508.

Chillicothe, Mo., county-seat of Livingston co., 75 mi. e. of Kansas City, on the Hannibal & Saint Joseph, the Chicago, Milwaukee & Saint Paul and the Wabash railroads. The principal industries include railroad roundhouses and machine shops, a furniture factory, a foundry, flouring mills and cigar factories. The surrounding country is agricultural. The town was first settled in 1835 and became a city in 1845. Population in 1910 6265.

Chillon, *shil′lon* or *she yoN′*, a castle and fortress in Switzerland, situated at the east end of Lake Geneva, on an isolated rock, standing out from the edge of the lake. It was once an important stronghold of the counts of Savoy, and the prison house of Francis Bonnivard, prior of Saint Victor, Geneva, from 1530 to 1536. It has acquired interest from Byron's poem, *The Prisoner of Chillon.*

Chills and Fever. See MALARIA.

Chimaera, *ki me'ra,* in classical mythology, a fire-breathing monster, with the head of a lion, the body of a goat and the tail of a dragon. He was killed by Bellerophon. See BELLEROPHON.

Chimbora'zo, a mountain of Ecuador, in the province of Quito, about 120 mi. from the coast. Though not the loftiest summit of the Andes, it rises to the height of 20,703 feet above the level of the sea and is covered with perpetual snow 2600 feet from the summit and upward. In 1880 it was ascended to the top for the first time by Whymper.

Chimes, a species of music, mechanically produced by the strokes of hammers against a series of bells, tuned to a given musical scale. The hammers are lifted by levers, acted upon by pins, or pegs, projecting from a cylinder, which is made to revolve by clock-work and is so connected with the striking part of the clock mechanism that it is set in motion by it at certain intervals of time, usually every hour, or every quarter of an hour.

Chim'ney, an erection, generally of stone or brick, containing a passage, or flue, by which the smoke of a fire or furnace escapes to the open air. The longer the chimney, the more perfect is its draught. The principle involved in the action of a chimney is that a column of heated air is lighter than a column of cool air of equal height. In the mixture of the warm and cool air, the result is that the weight of the latter forces the warm air upwards, and thus an upward movement of air is produced. Chimneys are not of great importance in warm climates, but in cooler regions the proper building and care of them require special attention. Previous to the twelfth century house chimneys were not in use, and they did not become general in England and Europe until the seventeenth century. Before this, fires were commonly built on stone or earthen floors in the middle of the room, the gases and smoke passing out through a hole in the ceiling.

Chimney Swift. See SWIFT.

Chimpan'zee, the native Guinea name of a arge, man-like African ape, of the same genus as the gorilla. When full-grown it is sometimes about five feet high, but it is not so large and powerful as the gorilla. Its body is covered with coarse black hair, which is very long on the head and shoulders. The chimpanzee walks erect better than most of the other apes. It feeds on fruits, often robbing the gardens of the natives, and constructs a sort of nest among the branches of the trees. It is common in menageries, where it shows much intelligence and docility. See APE.

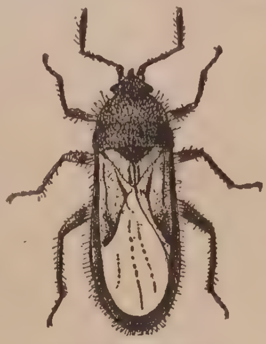
CHIMPANZEE

China. See CHINESE EMPIRE.

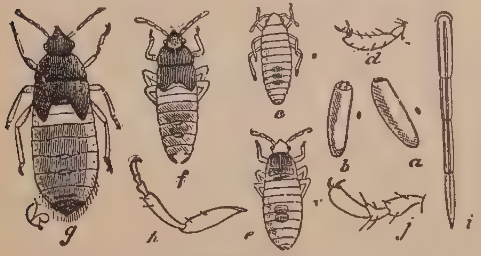
Chi'na Sea or **South Sea,** a sea to the southeast of Asia, having China and Formosa on the north, the Philippine Islands on the east, Borneo on the south and the Malay Peninsula and French Indo-China on the west. It forms the gulfs of Siam and Tonkin. It is frequented by violent typhoons, which seriously impede navigation at certain seasons. Forts on this sea are Canton, Hong Kong, Manila, Saigon, Bangkok and Singapore, and the largest rivers entering it are the Mekong, the Menan and the Sikiang.

China Ware. See POTTERY.

Chinch Bug, the worst insect pest known to the wheat-raiser. It is widely distributed, appears every year and in favorable seasons multiplies to such an enormous extent that it attacks all grains and most of the forage plants. Rarely is there any serious injury done during years when an abundance of rain falls, and often a period of wet weather quickly exterminates the insects for that year. The chinch bug is small and blackish and belongs to the same class with the squash bug. Each female lays many eggs, each of which is cylindrical and squarely cut off at one end. The newly hatched insect looks much like the mature bug and is pale reddish in color, with a yellow band across the abdomen. The insects begin feeding at once, climbing the stem of the plants and keeping together in great masses, moving on whenever the food is exhausted. Two broods are raised in a year, and the number of insects appearing some seasons is beyond computation. They move sometimes a quarter of a mile or more at a time, crawling over the ground and feasting on whatever comes in their way.



(Adult, much enlarged)



CHINCH BUG

a, *b*, eggs; *c*, newly hatched larva; *d*, tarsus; *e*, larva after the first shedding of its skin; *f*, the same, after the second molting; *g*, the pupa; *h*, enlarged leg of the perfect bug; *j*, tarsus of the same, still more enlarged; *i*, beak.

It is thought that $20,000,000 would not cover the annual damage of these bugs. Their spread can be prevented by making a barrier of tar around a field, or by digging holes, into which the insects fall and are destroyed, or, still better, by burning waste grass and refuse near the fields in the fall, as here the bugs hide during the winter.

Chinchil′la, a South American animal very closely allied to the rabbits, which they resemble in the general shape of the body and in the fact that their hind legs are longer than their fore legs. One species, about fifteen inches long, is covered with a beautiful pearly-gray fur, which is of great value. The chinchilla lives in colonies in the mountains of most parts of South America, makes numerous and very deep burrows and feeds on roots and tough vegetable growths. It is of a gentle, sportive nature.

CHINCHILLA

Chi′nese Empire or **Chi′na,** the largest empire of Asia and third largest in the world, situated between 18° and 54° north latitude, and 74° and 135° east longitude. Its greatest extent from east to west is 3000 miles, from north to south, 2400 miles, and its area is estimated at from 4,000,000 to 4,500,000 square miles. It is bounded on the n. by Siberia; on the e. by Siberia, Korea, the Yellow Sea, East China Sea and South China Sea; on the s. by Indo-China and India, and on the w. by Russian Turkestan. The outline of the empire is irregular, and its general shape is that of a triangle, with the longest side extending in a northwest direction. The coast line is quite regular, but it contains at the north the indentation forming the Gulf of Pe-che-le, and at the south the Gulf of Tonkin. Between these points there are numerous good harbors and roadsteads.

Political Divisions. The empire consists of China proper, Tibet, East Turkestan, Mongolia and Manchuria. Of these China proper is by far the most important, since it is the center of wealth and population for the empire; and this article is devoted mainly to this division. For description of the others, see East Turkestan; Manchuria; Mongolia; Tibet.

Surface and Drainage. The empire is bounded by lofty mountain ranges, including the Himalayas on the south and the ranges of the Plateau of Pamir on the west, while the Thian Shan and Altai Mountains form a portion of the northern and northwestern boundary. China proper is divided into three regions: the great plain, extending westward from Peking to the Hoang-Ho River and southward to the basin of the Yang-tse-kiang; the western highland region, west of the Hoang-Ho and extending to the western border, and the southeastern region, which consists of lowlands and hill country. The western region is generally high and mountainous, with numerous deep valleys through which flow mountain streams forming tributaries of the Hoang-Ho and Yang-tse-kiang. In the southeastern portion there is no very high land, though the country is decidedly hilly, so that it is well drained along the valleys of the

Hoang-Ho and Yang-tse in the great plain. In the southeast are the most fertile regions, and it is in these that the population is the most dense and that agriculture is brought to the highest degree of perfection found in the empire.

The most important rivers are the Hoang-Ho, flowing in an irregular course from northeast, east, south and then northeast, and watering the northeastern portion of China; the Yang-tse-kiang, which has a general northeasterly course and flows across the southern part of the country, and the Pi-Ho, which drains the region around Peking. Each of these rivers is navigable, and all are important waterways. The Hoang-Ho has changed its lower course many times in the last few centuries, and on such occasions it has caused much destruction to life and property. The valleys of all these rivers are densely populated. Lakes are few and small, the largest being Tung-ting-hu, which is about 60 miles long and located near the center of China. In the northern part of the country the surface is covered with a deposit of brownish-yellow earth of remarkable fertility.

CLIMATE. The greater part of China belongs to the temperate zone, but it has what is called an excessive climate. At Peking in summer the heat ranges from 90° to 100° in the shade, while the winter is so cold that the rivers are usually frozen from December to March. At Shanghai the maximum temperature reaches 100°, and the minimum falls at least to 20° below freezing point. In the south the climate is of a tropical character, the summer heat rising to 120°. Here the southwest and northeast monsoons blow with great regularity and divide the year between them. Among the greatest scourges of the country are the dreadful gales known as typhoons (See TYPHOON). They never fail to commit great devastation, though happily they always give such timely notice of their approach that preparations can be made. The Hoang-Ho and Yang-tse-kiang basins have a rather equable temperature, due to the soft, moist winds of the Pacific.

MINERAL RESOURCES. China is well supplied with minerals, the most important of these being coal and iron and inexhaustible beds of kaolin, or porcelain clay. The largest coal field known in the world exists in the highlands in the province of Shan-si, where extensive beds of anthracite occur. West of this province is an extended deposit of bituminous coal, and other fields are found west of the Hoang-Ho River, while smaller fields, but equally important because of their location, are found west of Peking. Coal fields also cocur along the Siang and Lei rivers and at various places in the valley of the Yang-tse. Iron ore is found in the vicinity of the coal regions in Shan-si, as are also limestone and potter's clay. In the province of Yun-nan, in the extreme southwestern part of China, are found deposits of copper, silver, lead and gold. Salt occurs in the valley of the Hoang-Ho, near the great bend where the river turns eastward, and also in the southwest part of Yun-nan. Lack of transportation facilities and the absence of suitable tools and machinery prevent any of these deposits from being extensively worked.

VEGETATION AND ANIMAL LIFE. See ASIA, subheads *Vegetation* and *Animal Life*.

AGRICULTURE. With the exception of extremely mountainous regions, all of China is covered with a fertile soil, which will admit of successful cultivation as far as 7000 and 8000 feet above the sea. Agriculture is the most important industry and the one most highly venerated, as well. Once a year the emperor, in the presence of the highest court officials and royal family, turns a furrow and sows some seed in the honor of agriculture. The land is divided into small holdings, the largest farms never exceeding a few acres in extent. While the most primitive methods and implements are used, the exceeding care and patience of the Chinese in fertilizing and tilling the soil assure good crops, and a failure is seldom known. The land along the hills and on the upper levels is often irrigated by water from the streams. Since these hills are graded into terraces, the entire country, in many of the river valleys, has the appearance of a vast garden. The water is raised from the river by wheels containing buckets. These are operated by animal power or by men. The first wheel raises the water to the first level, a second takes it from this to the next, and so on until it has been transferred to the highest point in the district to be irrigated. From this point it is distributed through small channels, so that each section of land receives its share. Rice is the principal food of the people and is by far the most important crop. Most of this is grown in the middle and southeastern sections of the country. In the latter, two mature crops are obtained each year, and a third crop is usually grown, which is plowed under green for manure. In the northern and northwestern sections, a variety known as dry-soil rice is cultivated like ordinary grains. In this region, also, wheat, corn and other cereals are abundant. The raising of vegetables is also an important industry. Next to rice, from a commercial point of view, the most important crops are tea and the mulberry, which is the food for the silkworm (See Silk; Tea). Ginseng, tobacco, sugar cane, indigo and numerous plants valuable for their roots are also raised, and the poppy is grown to such an extent that the importation of opium is now comparatively small. In the southern part of the country cotton is also grown to some extent.

Manufactures. The Chinese have made considerable progress in manufacture, though they have never taken kindly to the introduction of the tools and machinery of the nations of Europe or America. Nearly all of their processes are carried on by manual labor, and in their various manufactures the Chinese display the greatest skill. The most important industry is the manufacture of silk, finer grades of which are produced in China than in any other country of the world. The embroidery of silk is also carried on with remarkable proficiency, showing a high degree of mechanical skill and the finest artistic taste. Silk is the most common fabric for clothing of the wealthy classes and is prescribed for the raiment of all public officials of high rank. The poorest people also manage to deck themselves in coarser varieties—if not as a common article of apparel, at least on festive occasions. Cotton goods are manufactured to a considerable extent, though a large quantity of these are now imported from Europe and the United States. The manufacture of a fabric known as grass cloth is also important. This has an appearance of linen and is valuable in the manufacture of clothing. Another important industry is the manufacture of chinaware, in which for centuries the Chinese excelled all other nations, but their productions are now surpassed by certain European countries. Lacquer ware is also made in large quantities. The metal work most deserving of notice consists in the manufacture of small articles, such as gongs, mirrors and statuettes in copper and bronze, and in the production of various kinds of carved and filigree work in gold and silver. The Chinese are also noted for their skill in making small articles from ivory, wood, shell and mother-of-pearl, such as card cases, seals, combs and chessmen. Many of these objects are remarkable for their beautiful carvings.

Transportation and Commerce. The inland trade of China is very extensive, so large that its amount cannot readily be estimated. The rivers and canals swarm with boats, junks and barges of all sizes. Roads in the interior are entirely lacking or are so poor that they will not admit of the passage of wagons. For this reason water communication is all-important, and the great rivers, such as the Hoang-Ho and the Yang-tse-kiang, furnish the chief outlet to the sea. The Yang-tse is navigable for large steamers for more than 1100 miles and for smaller boats for a considerable distance beyond this. The Grand Canal connecting Hankow with Tientsin, 700 miles long, has been in use since the eleventh century and is still an important waterway. Considering the extent of the country, railroads are few, there being in all only about 3000 miles in operation. These are under the management of foreign corporations and were constructed by foreign capital. The important lines are the one extending to Port Arthur from the main line of the Trans-Siberian railway; a line from Peking along the shore of the Gulf of Pe-che-le to connect with the Port Arthur line; also another, under British control, extending from Peking to Tientsin. A German corporation has been granted the right to build a line from Peking east and southeast to the Bay of Kiao-chau, which, when completed, will furnish an important outlet for a large tract of fertile and densely populated country. An American concession has been obtained for the construction of a line from Hankow to Canton and neighboring ports. This line will be about 1000 miles in length. The development of railway enterprises is greatly hindered by the religious belief of the people, nearly all of whom are ancestor worshipers. Without disturbing burial places it is impossible to construct railway lines, and since the Chinese consider the remains of their ancestors sacred, they do not readily consent to their removal.

The foreign commerce of the country amounts to about $407,000,000 a year. Of this over $240,000,000 is in imports and $167,000,000 in exports. The foreign commerce is carried on through what are known as treaty ports, which are cities specially opened by government decree to foreign trade. There are forty-two such cities, some of them being on the great rivers, several hundred miles inland.

Spheres of Influence. The leading nations in foreign trade are India, Great Britain, the United States, Germany and France. Because of the tendency of the Chinese to retain all the customs of their ancestors, which customs are so far removed from modern business methods as to greatly impede commercial transactions, the leading European nations have secured special privileges extending over certain territories. These are known as spheres of influence. Previous to the Russo-Japanese War Manchuria and Port Arthur were practically under Russian control. The region around Kiao-chau is under German influence, and Hong Kong and the neighboring cities on the coast are under British influence. These spheres of influence are not controlled by foreign governments, but within them each government is granted special concessions, which give its citizens advantages over those of other foreign nations in the same territory.

INHABITANTS. The Chinese belong to the Mongolian race, but they do not represent the harsher features of this race, as found in the genuine Tartars. They are of low stature, have small hands and feet, a dark complexion, wide forehead, straight black hair and eyes and eyebrows obliquely turned upward at the outer extremities. The queue is the most striking thing in their appearance. They are inferior to Europeans and Americans in bodily strength, but are superior to most other Asiatics in their physical endurance. They have many excellent moral qualities, are strongly attached to their homes, hold age in respect, are unusually industrious and toil continually for the support of their families. In the interior, where they have not been corrupted by contact with foreign nations, they exhibit remarkable simplicity of manners. However, the Chinese are not free from vices. They are noted for treachery and for their untruthfulness in dealing with strangers. They are exceedingly polite in their intercourse with one another, but this politeness often lacks sincerity. Gambling is a universal vice among them, and many are addicted to opium smoking and to drunkenness.

Their food consists largely of rice, fresh pork, fish, fowls and vegetables. Beef and mutton are seldom used. Tea is the universal beverage and is drunk in large quantities.

With rare exceptions, the men and women of the household are kept strictly separate. Marriage is universal and is provided for at an early age, and the negotiations are conducted by parties who devote themselves to match-making. The marriage ceremony is characterized with gay processions and other festivities. While polygamy is not sanctioned by law, it is often practiced. Women are considered far inferior to men and have practically no social or educational advantages. Among the poor, female children are occasionally put to death soon after birth.

The houses are usually of one story and built of bricks, earth or thatch, with brick tiling for a roof and wood for the interior. The interior contains a series of rooms which are separated and lighted by intervening courts and communicate with one another by side passages. In the best houses there are chambers set apart for the worship of ancestors, and in these religious ceremonies are regularly performed. The languages of different parts of the empire are kindred, but sections wide apart show quite different dialects.

GOVERNMENT AND RELIGION. The government in theory is an absolute monarchy, with the emperor at its head. The crown is hereditary through the eldest son, but the ablest son or another near relative may be nominated for the position. However, he can only maintain his position by showing his ability to conduct the government in accordance with the principles laid down in the sacred books. The emperor is considered the son of Heaven, and in matters of legislation and administration his authority is absolute, with the exception that he must conform to the principles and customs of the country. The emperor is assisted by a cabinet of ministers of state. This consists of four members, two of Manchu and two of Chinese origin, and to these are added two others from the great college. The government is divided into seven administrative departments, each of which is subordinate to this main council, or cabinet. Each political division, such as China, Manchuria and Mongolia, is governed by a mandarin appointed by the emperor. These divisions are divided into districts, over each of which are local governors and other officials. The governing class constitutes an autocracy, and while the officers are supposed to be guided by a system of laws, these are seldom followed, and peculation, oppression and extortion characterize the administration from the emperor to the lowest officials. In 1908 a constitution to go into effect in nine years was promised. In 1910 a senate was assembled and remained in session several months, enacting several important laws. Telegraph lines connecting the important cities are maintained, as is also a very imperfect mail service, at government expense. Foreign affairs are conducted by the foreign office, called *Wai-wu-pu*. This organization was formed in 1901 and superseded the old foreign office, known as *Tsung-li-Yamen*.

The principal religious beliefs of the Chinese are Buddhism, Confucianism and Taoism. These are embraced by the great mass of people. Confucianism and Taoism were developed within the country, but Buddhism was introduced from India. Missionaries are tolerated, but are not encouraged. There are possibly a million followers of the Roman Catholic faith, and various Protestant denominations have each a few thousand converts. See CONFUCIUS.

EDUCATION. For centuries the Chinese have been known for their education. Among the men illiteracy is almost unknown, and all classes have the highest respect for literature. Primary instruction is provided throughout the empire and is open to all classes. The primary schools are supplemented by higher institutions, which culminate in the great university. Recently measures have been taken to place the colleges and the university on a footing very closely resembling that of the best universities of Europe and America. The study of sciences and of the history of foreign nations has been attempted. The competitive examinations are conducted throughout the country at stated periods, and it is through these that the best government positions are obtained. However, the subjects upon which these examinations are given are literature, Chinese philosophy and religion, and their acquisition does not particularly fit one to discharge the duties of a public office.

ARMY AND NAVY. See ARMY, subhead *China*; NAVY, subhead *China*.

CITIES. China contains a large number of great cities, but most of these are merely aggregations of people, and only a few of them are of political or commercial importance. Chief among these are Peking, the capital; Hankow, Tientsin, Canton, Shanghai, Nanking, Fu-chow and Hong Kong, each of which is described under its title.

LANGUAGE AND LITERATURE. The Chinese language is the most important and most widely spread of the so-called monosyllabic languages of eastern Asia, in which each word is uttered by a single movement of the organs of speech. There is no alphabet, and each word is represented by a single symbol or character. The same word may stand for a number of different ideas, and its exact meaning must be decided by its position in the sentence. There are also certain words which are attached to other words to show grammatical relations. As there are only about five hundred simple syllabic sounds in the Chinese language to do duty for a vastly larger number of ideas, a system of tones is employed. Some sounds may be pronounced in as many as eight different tones, each of which has a different meaning; and it is this system of tones which makes the language so difficult for a Westerner to learn. The written characters in the Chinese language were probably originally hieroglyphics, or rude copies of the objects designed to be expressed by them; but the hieroglyphic features have almost entirely disappeared, and many of the symbols are formed of what seems to be an arbitrary combination of lines. Most of the written characters are formed by a combination of the old ideographic element with a phonetic element. In writing or printing, characters are arranged in vertical columns, to be read from top to bottom.

The Chinese are a distinctly literary people, and their literature is unquestionably the most important of Asia. It dates back perhaps to the twentieth century B. C., but the first important volume of which we have knowledge was written in the twelfth century B. C This was one of the "Five Classics," or *King*, which formed the oldest and one of the most important parts of Chinese literature. The "Four Books," written by Confucius and his disciples, are next in value to the earlier "Five Classics." Among the most important works which have been produced in China are the historical and geographical works, and writings on the sciences and on philosophy are also numerous. There are, too, voluminous collections of poetry and numerous dramas and novels which have never been made known to Europe.

HISTORY. The early history of China, which, according to some authors, reaches back for hundreds of thousands of years, is enveloped in mystery; and not until the twenty-seventh century before the Christian era was there a ruler of whom we have any record. Even of this ruler little is known beyond the fact that he built roads and organized the empire into administrative departments. With the reign of Yao in 2356 B. C., Confucius begins his record, and although his statements cannot be taken for authentic historical information, his accounts of Yao and his successors, Shun and Yu, give a general idea of the epoch. These kings greatly extended the empire and ruled so well and so justly that they have been regarded as the model for all rulers since their time. Their successors lacked their virtues, however, and by 1766 B. C. a new dynasty had arisen, known as the Shang dynasty. The most of the rulers of this line, which reigned until 1154 B. C., were unfitted for ruling, and the country prospered little under them. Better times came to the empire with the accession of the Chow dynasty in 1122 B. C. It is certain that under this dynasty internal improvements took place in the country; the people changed generally from their former nomadic life to a settled agricultural existence, and civilization reached a comparatively high point for that early date. It was during this dynasty, about 551 B. C., that the great Confucius was born. Internal feuds disturbed the empire, and by 255 B. C. the Chow dynasty was overthrown by the Tsin or Chin dynasty, from which China takes its name.

One of the rulers of this line, wishing to have his own reign go down in history as the beginning of the empire, destroyed all the literature which dealt with previous ages and had over four hundred learned men buried alive that they might not produce new records. He was defeated in his project, however, by the fact that the books of Confucius were discovered later. It was during the Tsin dynasty that the great Chinese Wall was erected to keep out the Tartars (See GREAT WALL OF CHINA). From the days of the Tsins a number of dynasties have ruled China, some of which brought the country to a very high point. Under the Tang rulers learning was especially cultivated. In 924 A. D. printing was invented, and the practice of binding the feet of the women was introduced at about the same time.

In the thirteenth century the Mongols overran China and established the Mongol dynasty. Kublai Khan, the most famous of the Mongol rulers, brought China to a point of splendor which it had never attained before. During his reign Marco Polo, the Venetian traveler, visited China and brought back accounts of the high state of civilization which it had attained. Under the reign of the Ming dynasty, which ruled from 1368 to 1644, the Portuguese visited China and settled at Macao. Under the last half of this line internal affairs in China became greatly disturbed. Rebel bands throughout the empire menaced the throne itself, and finally, to put down these rebels, the Manchus were invited into the country. They did indeed put down the rebel armies, but when their object was accomplished and the Chinese wished them to retire, they refused to do so. They took possession of Peking and proclaimed a Manchu prince emperor, thus founding the present dynasty of China. Opposition to the new rulers gradually died out, and the conquerors, who were of course greatly inferior in numbers to the conquered, were gradually merged with the original inhabitants of the country. Almost the only custom which the Manchus forced upon the Chinese was the wearing of the cue, or pigtail. The most famous of the Manchu emperors was Kang-hi, who reigned from 1662 to 1722. He was no less remarkable as a scholar than as a general, as is proved by the dictionary of the Chinese language which was published under his superintendence. Tibet was deeded to the emperor during his rule, and the country was exceedingly prosperous. The one great disaster was the earthquake at Peking, in which, it is said, 400,000 people were killed.

From its earliest days China has shown an unconquerable aversion to intercourse with other countries. As long, however, as English trade relations were conducted through the East India Company, matters were generally satisfactory, because the Chinese, unable to understand the political standing of the company, treated with them as with a company of merchants with whom no diplomatic relations were necessary. When in 1834 the monopoly of Chinese trade was taken from the East India Company and the British merchants were represented in China by a commissioner appointed by the British government, misunderstandings at once arose. The opium trade was the chief cause of disagreement. All traffic in opium had been decreed illegal by the Chinese government, but the decrees had never been strictly enforced. When, however, in 1837, the Chinese government did determine to enforce its edicts, the British government, to whom the opium trade was worth millions of dollars annually, refused to act with China. As a result, war broke out in 1840. The struggle was most disastrous for China, and in the treaty of peace which was signed in September, 1842, the English were given permission to trade freely at Shanghai, Ning-Po, Fu-Chow, Canton and Amoy and received Hong Kong, besides an indemnity of $21,000,000. No mention was made of the opium question. Two years later the United States and France each succeeded in making a trade treaty with China, similar to the one which Great Britain had made.

In 1856, as China refused redress for certain grievances of Great Britain, war again broke out between the two countries. France joined England, and the struggle was not terminated until 1860, when the allied armies took Peking. This war, which, added to internal troubles, had seemed an unmixed calamity, proved to have its compensations, for the foreign powers after the treaty with China showed themselves ready to help her in putting down a severe rebellion which had arisen in the empire. Hung-siu-tseuen, a schoolmaster who through reading Christian tracts had grasped some idea of the Christian religion and had convinced himself that he was a Heaven-sent ruler, headed a rebellion which in the three years after 1850 reached great dimensions. The rebels had seized Nanking, which they had made their capital, and Hung-siu-tseuen had had himself proclaimed the founder of a new dynasty, to be called the Peace dynasty. A small army, under the leadership, first, of an American, Ward, and later, under the leadership of Charles George Gordon, finally succeeded in putting down the rebellion, which is generally known as the Tai-ping Rebellion (See GORDON, CHARLES GEORGE). The ten years that followed witnessed a general revival of the strength of the empire. In 1894 China became involved in a war with Japan (See JAPAN, subhead *History*). Difficulties in Korea, over which China claimed suzerainty, led to the interference of the two powers, and their inability to agree as to the future government in Korea at last brought on open war. China was completely defeated in the struggle and was forced, in 1895, into a treaty which ceded to Japan the island of Formosa and the peninsula of Liao-tung, on which was situated Port Arthur, China's strongest fort. China also promised the payment of an indemnity of about $150,000.000. The European powers, especially Russia, were by no means willing to have the Liao-tung peninsula given up to Japan. Russia herself had been for years very anxious to gain possession of an ice-free port for her Siberian territory, and Port Arthur seemed to offer the most favorable outlet. In conjunction with France and Germany, therefore, she brought such pressure to bear upon Japan that she gave back to China all of the ceded territory except the island of Formosa. Russia, as the price of her interference, obtained special privileges, among them a lease of the harbor of Port Arthur.

For a time after the close of the struggle with Japan, it seemed as if the reform party in China might gain the upper hand and bring China into a closer relationship with other nations. The great influence of the empress dowager, however, finally made reactionary measures prevail, and anti-foreign demonstrations broke out in many parts of the country. By decree of the emperor, practically all power was placed in the hands of the empress dowager, and it was generally felt that she was encouraging, tacitly, at any rate, the outbreaks in various parts of the empire. In Shan-tung the organization popularly known as the Boxers became active. The origin of this movement is obscure. Its name is derived from a translation of the Chinese name, "The fist of righteous harmony," and it appears to have been originally a secret association of men chiefly from the lower classes. It is not known whether the empress and her advisers deliberately turned the revolutionary movement into channels where it would work against the foreigners, rather than against the imperial government, or whether they carelessly allowed it to grow until it was beyond their control; at any rate, even when the Boxers carried about banners on which were inscribed, "Exterminate the foreigners and save the dynasty," the representatives of the powers at Peking were able to secure no measures against them.

Matters went from bad to worse. In May, 1900, a number of Christian villages were destroyed, and many native converts were massacred in the neighborhood of the capital. In June, the chancellor of the Japanese legation was murdered, and later in the same month the German ambassador, Baron von Ketteler, was assassinated. The foreign representatives, with their households and guards, collected in the British legation, which they fortified, and here they were besieged by the Chinese troops. Not until the fourteenth of August did the allied forces of Japan, Russia, England, America and France reach Peking and relieve the legations. They were just in time, for the situation of the besieged had grown desperate. Peking was taken by the allies, the imperial court escaped into the interior and the army marched through the sacred Forbidden City. After some months of negotiation with Li Hung Chang and Prince Ching, the terms of peace agreed upon were submitted to the imperial government. The treaty provided for an indemnity to be paid to all states, societies and individuals who had suffered in the rising; forbade the importation or manufacture of arms or ammunition; threatened with death any members of anti-foreign societies, and provided for the fortification of the legation district and the occupation by the foreign powers of certain strategic points between the capital and the coast. In February, 1901, these terms were accepted by China. Shortly after the ratification of the treaty, the foreign troops were withdrawn, with the exception of the guard provided for the legation, and the court returned to the capital. Population, estimated at 350,000,000. Consult Parker's *China, Past and Present,* and Scidmore's *China, the Long-lived Empire.*

Chinese Exclusion, the policy adopted by the United States government, about 1880, because of the vast immigration of Chinese laborers into the Western states, to the alleged detriment of American laborers in that region. An act to restrict this immigration was passed in 1879, but was vetoed by President Hayes, because it violated a treaty with China, signed in 1868. In 1880 a treaty was made, giving the government of the United States the right to regulate, limit or suspend Chinese immigration, but withholding the right absolutely to prohibit it. An act of 1882 suspended immigration for ten years and forbade the naturalization of Chinese. As amended in 1888 it practically made Chinese exclusion permanent. In 1892 the Geary Law was passed, continuing exclusion for another ten years and compelling the Chinamen already in the United States to secure certificates of residence. This was reaffirmed and enlarged in 1902. The total number of Chinese in the United States in 1900 was reported as about 90,000.

Chin-Kiang-Fu, *cheen kyahng foo',* a city and port of China, situated on the right bank of the Yang-tse-kiang, near the junction with the Imperial Canal. It has many advantages for trade, which in 1897 amounted to $17,000,000. The city was taken by the British in 1842 and suffered severely during the Tai-ping rebellion in 1853. Population, about 140,000.

Chinook', the name of a warm, dry wind, which blows over the Rocky Mountains in Montana and Wyoming and some of the Canadian provinces. It is supposed to have taken its name from the Chinook indians, as the early settlers of this region thought that it came from the territory occupied by them. The Chinook is caused by the descent of the current along the mountain slopes. As the air descends it becomes warmed by compression, and a descent of 5000 feet will raise the temperature about 30°. Previous to its passing over the mountains the air has been robbed of its moisture, so that in its beginning the Chinook is a dry wind, and as its temperature is raised its capacity for moisture is increased; consequently, it melts the snow and clears the sky. The Chinook occurs during the winter and early in the spring and makes it possible for stock to graze in these regions during the entire winter. The hot winds of Kansas and Nebraska probably originate from a similar cause, and the wind in the Alps, known as the *Foehn,* is similar to the American Chinook.

Chinook, the name of a tribe of indians now extinct, but once strong and important in their home near the mouth of the Oregon. There they built large canoes and fished in the sea. Many words of their language are still in use in the *Chinook jargon,* a medley of English, French and indian words, that is the language of the traders among tribes farther north.

Chios. See Scio.

Chip'munk, the popular name in America for several small squirrels, but especially for the small striped ground squirrel, about six inches long, and in color reddish-brown, with black and white stripes along its back. It is a cheery, friendly little creature, so very curious that it will approach very close to a person and sometimes will even fearlessly explore the clothing. Its shrill notes of alarm often attract attention, when it would remain wholly unseen if it kept quiet. Its food consists of nuts and grains, which it stores up for winter use.

Chip'pewa. See Ojibwa.

Chippewa, Battle of, a battle of the War of 1812, fought July 5, 1814, between an American force under General Jacob Brown and the British under General Riall. The former had captured Fort Erie on July 3 and proceeded northward on the Canadian side of the river. He overtook the British at Chippewa and inflicted a severe defeat, though at first a determined charge by the British almost won the day. The American loss was 355; the British, 604.

Chippewa Falls, Wis., the county-seat of Chippewa co., about 100 mi. e. of Saint Paul, Minn., on the Chippewa River, and on the Wisconsin Central, the Chicago & Northwestern, the Chicago, Milwaukee & Saint Paul and other railroads. The city has good water power and contains manufactures of lumber, wooden ware, flour, foundry products, shoes and other articles. The state home for feeble-minded and the county insane asylum are located here, and the city has a public library and a fine court.

house. The place was settled in 1838 and was chartered as a city in 1870. Population in 1910, 8893.

Chiromancy, *ki'ro man'sy.* See Palmistry.

Chiron, *ki'ron,* the most famous of the Centaurs, a race fabled as half men, half horses. He lived at the foot of Mount Pelion, in Thessaly, and was celebrated through all Greece for his wisdom and for his skill in medicine and music. The greatest princes and heroes of the time, Bacchus, Jason, Hercules, Achilles and Aesculapius, were his pupils.

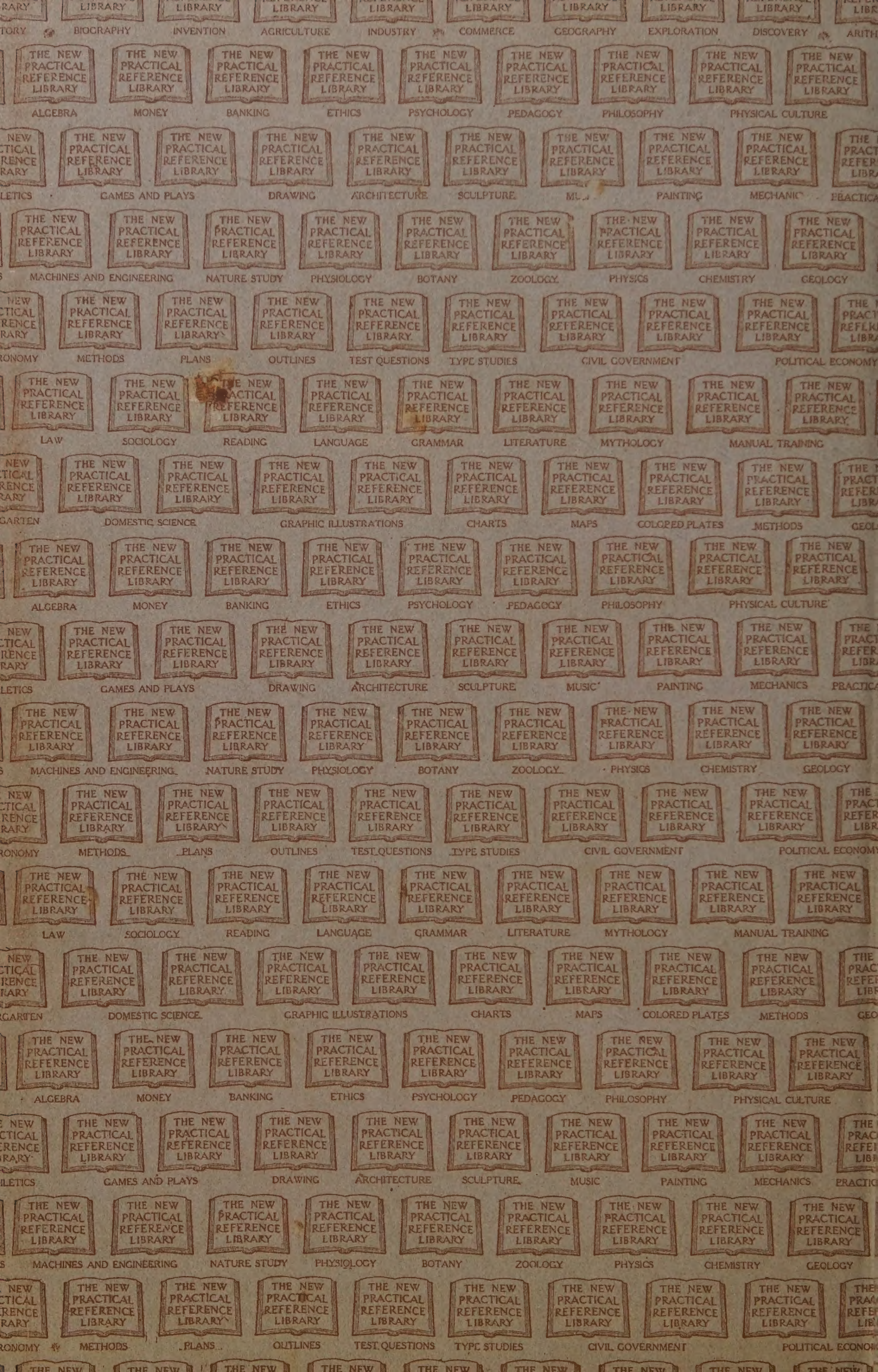
Chiroptera, *ki rop'te ra,* an order of mammals which have more or less the power of flight. The fingers of the fore limbs are greatly elongated and carry, between these and the hind limbs and tail, a thin membrane which forms the wings. The bones are slender and filled with a light marrow, and this lessens the animal's weight. The ears are often large in proportion to the size of the animal, whose sense of hearing is remarkably acute. See Bat; Vampire Bat.

Chisel, *chiz'el,* an edged tool, used in cutting wood, iron and other metals. The chisel is worked by pressing on the handle, or by striking it with a hammer or mallet. The carpenter's chisel has a handle of wood, which is attached by having a shank of the blade driven into it, or by being driven into the shank, when the latter is hollow. Chisels used for cutting metal do not have wooden handles. The sharp edge of the blade is formed by being beveled, and when the chisel is in use the side not beveled should be placed next to the work. In the cutting of mortises, the chisel should be placed upon the mark indicating the end of the mortise, held in a vertical position and then pressed or driven downward by light strokes from a mallet. Occasionally the chisel needs to be used as a plane. In such a case the beveled side may be held next to the work. In the sharpening of a chisel, the beveled portion of the blade should be placed on the hone and the tool should be moved back and forth without rotary motion. The edge may be finished by laying the other side of the blade flat upon the hone and giving it a few light strokes.

Chitons, *ki'tonz,* a family of mollusks whose shells consist of many successive portions, often in contact with, and overlapping, one another, but never truly joining. The shell in the typical chiton is composed of eight pieces, and the animal adheres to rocks or stones after the fashion of the limpet. There are many species, and few rocky shores are without some of them.

Chivalry, *shiv'al ry,* a term which indicates strictly the organization of knighthood as it existed in the Middle Ages, and in a general sense the spirit and aims which distinguished the knights of those times. The education of a knight in the days of chivalry was as follows: When he was seven years of age he was sent to the court of some baron or noble knight, where he acquired skill in the use of arms, in riding and in attending on the ladies. When his age and experience in the use of arms had qualified him for war, he became an esquire or squire and accompanied his lord in battle. The third and highest rank of chivalry was that of knighthood, which was not conferred before the twenty-first year, except in the case of distinguished birth or great achievements. The person to be knighted prepared himself by confessing, fasting and keeping vigil all night over his arms; religious rites were performed, and then, after promising to be faithful, to protect ladies and orphans, never to lie nor utter slander, to live in harmony with his equals and to protect the Church, he received the *accolcde,* a slight blow on the neck with the flat of the sword from the person who *dubbed* him a knight. This was often done on the eve of battle, to stimulate the new knight to deeds of valor, or after the combat, to reward signal bravery. Though chivalry had its defects, chief among which, perhaps, was a tendency to certain affectations and exaggerations of sentiment, yet it tempered in a very beneficial manner the rudeness of feudal society. As a system of education for the nobles, it taught them the best ideals, social and moral, which the times could understand.

Chloral, *klo'ral.* a colorless, oily liquid, commonly prescribed in the form of its hydrate. It is the poisonous principle in "knock-out drops." The *hydrate of chloral,* as now prepared, is a white, crystalline substance. which, in contact with alkalies, separates into chloroform and formic acid. Chloral kills by paralyzing the action of the heart. It is a hypnotic, as well as an anesthetic, and it is frequently substituted for morphia. It has been successfully used in delirium tremens, Saint Vitus's dance, poisoning by strychnia, lockjaw and some cases of asthma and whooping cough. It should be taken with great caution and under medical advice, as an extra dose may produce serious symptoms, and even death. In the treatment of poisoning by chloral, the person should be kept awake, his body warmed by friction or otherwise, and artificial respiration resorted to, if necessary.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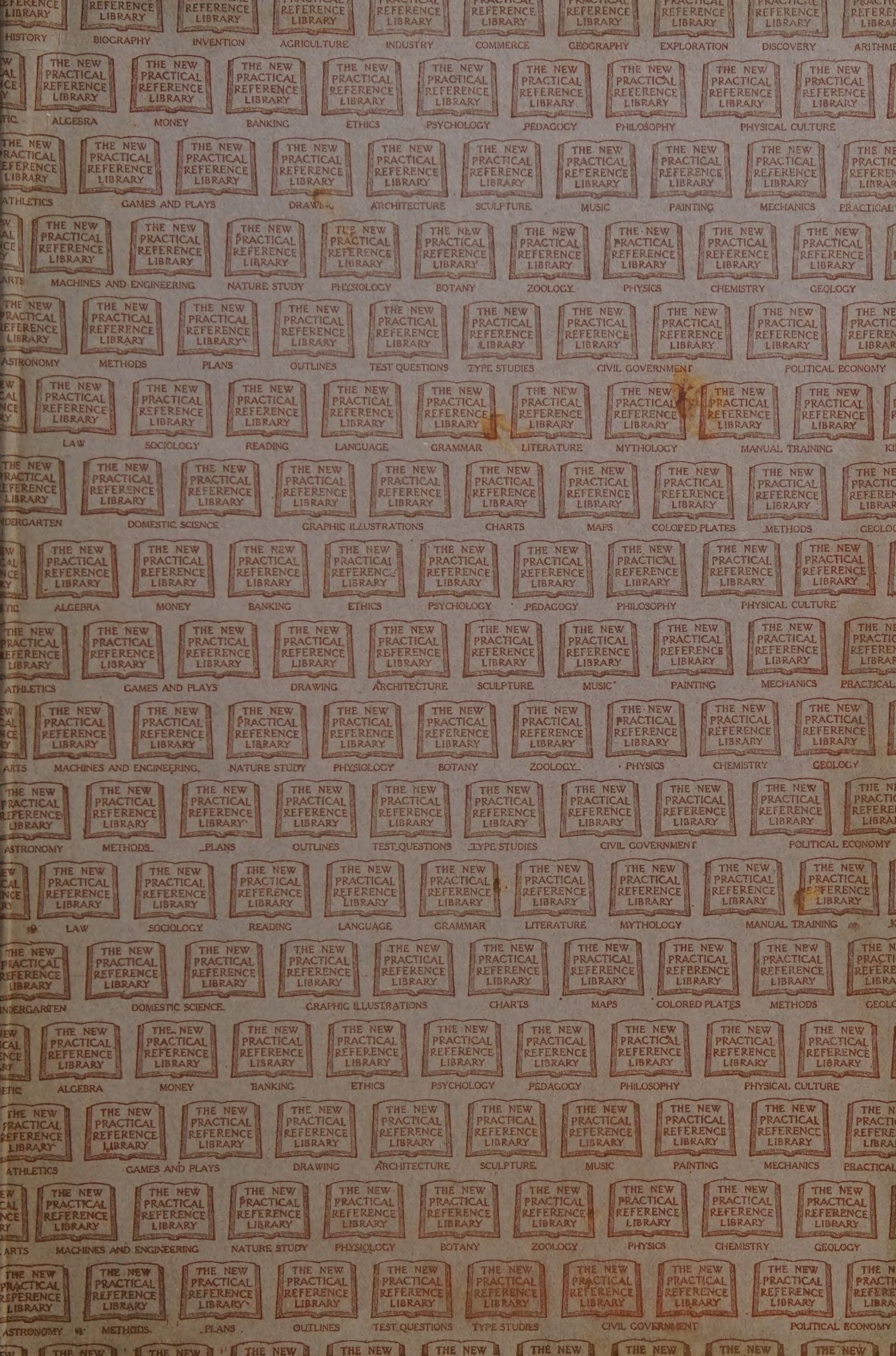
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